

2020-06

# The challenge of reducing road traffic accidents in establishing a sustainable healthy urban community in Tanzania

Walugembe, Francis

NM-AIST

---

<https://dspace.nm-aist.ac.tz/handle/20.500.12479/1010>

*Provided with love from The Nelson Mandela African Institution of Science and Technology*

**THE CHALLENGE OF REDUCING ROAD TRAFFIC ACCIDENTS IN  
ESTABLISHING A SUSTAINABLE HEALTHY URBAN  
COMMUNITY IN TANZANIA**

**Francis Walugembe**

**A Dissertation Submitted in Partial Fulfillment of the Requirements for the Degree of  
Master of Science in Public Health Research of the Nelson Mandela African Institution  
of Science and Technology**

**Arusha, Tanzania**

**June, 2020**

## **ABSTRACT**

Road traffic accidents (RTAs) are increasingly becoming a big concern in the public health domain. Globally, RTAs kill 1.35 million people annually, approximately 3700 deaths daily and 20 - 50 million injuries per year. Over 90% of injuries and deaths still occur in low and middle-income countries like Tanzania. Available literature indicates that Tanzania suffers massive human and economic losses every year from RTAs despite several interventions that have been made to curb these. There is need to examine persistent case fatality rates from RTAs in Ilala and other municipalities in Dar es salaam Region in Tanzania to gain an insight into the current state of RTAs. This study was thus, undertaken to assess the challenges of reducing RTAs in in Ilala District, Tanzania from 2014 to 2018 and to assess the progress in curbing road carnage. A cross-sectional research design was employed using questionnaires, interviews and focus group discussions (FGDs) to collect data which was analyzed using both quantitative and qualitative methods. A total of 331 respondents comprising 14 traffic police officers, 102 drivers, 100 motorcyclists, 24 medical personnel, 46 traders, 25 teachers and 20 students provided data for the study. A total of 6772 road traffic injuries were reported between the years 2014 and 2018 and the highest RTAs were recorded for the year 2014. A general downtrend is noted from 15420 accidents in 2014 to 3732 in 2018 in Tanzania; which is equivalent to 76% reduction. In Dar es Salaam city, RTAs reduced from over 6000 in 2014 to almost 2000 in 2018 (67% reduction). About 28% of the total fatalities were recorded for pedestrians, followed by passengers. Responses to timely handling of accidents, community engagement and effects of road accidents were analyzed and four variables age, occupation, education and location were statistically significant at 5% ( $p < 0.05$ ) using a chi square test suggesting that those variables were indeed good explanatory variables. Although significant reduction of RTAs has been recorded in the past four years, there are still substantial number of fatal and non-fatal accidents that can be prevented. Because most of these accidents arise from human errors, concerted efforts are needed in enforcing traffic laws to further reduce this carnage.

## DECLARATION

I, Francis Walugembe do hereby declare to the Senate of Nelson Mandela African Institution of Science and Technology that this dissertation is my own original work and that it has never been submitted for degree award in any other institution



.....  
Francis Walugembe

**Name and signature of candidate**

.....  
**Date**

**The above declaration is confirmed**

.....  
Dr. Dickson W. Lwetoijera, Adjunct Professor

**Name and signature of supervisor**

.....  
**Date**

.....  
Dr. Levira Francis

**Name and signature of supervisor**

.....  
**Date**

## **COPYRIGHT**

This dissertation is copyright material protected under the Berne Convention, the Copyright Act of 1999 and other international and national enactments, in that behalf, on intellectual property. It must not be reproduced by any means, in full or in part, except for short extracts in fair dealing; for researcher private study, critical scholarly review or discourse with an acknowledgement, without the written permission of the office of Deputy Vice Chancellor for Academics, Research and Innovations, on behalf of both the author and the Nelson Mandela African Institution of Science and Technology.

## **CERTIFICATION**

The undersigned certify that they have read the dissertation entitled “The Challenge of Reducing Road Traffic Accidents in Establishing a Sustainable Healthy Urban Community in Tanzania” and recommend for examination in partial fulfillment of the requirements for the award of the degree of Master of Science in Public Health Research of the Nelson Mandela African Institution of Science and Technology.

.....

Dr. Dickson W. Lwetoijera, Adjunct Professor

**Name and signature of supervisor**

.....

**Date**

.....

Dr. Levira Francis

**Name and signature of supervisor**

.....

**Date**

## **ACKNOWLEDGEMENTS**

I first and foremost thank the Almighty God for giving me the strength to carry out this research. Secondly, my supervisor Prof. Dickson Wilson Lwetoijera deserves my deepest appreciation for his time, tireless scientific input, personal skills, guidance and continued support regardless of circumstances which altogether saw me through this research. May our scientific cooperation and friendship continue to grow. I also express my deepest thanks to Dr. Levira Francis for supervising this research and for his relentless support.

I extend my sincere appreciations to Ifakara Health Institute (IHI) and the African Development Bank for facilitating and sponsoring this study. Additionally, I thank the Nelson Mandela Institution of Science and Technology (NM-AIST) for offering me the chance to study at the prestigious Bagamoyo campus. Special thanks also go to Mr. Julius Lenguyana for his encouragement and support as AfDB Project Manager - NM-AIST. Last but not least, I am deeply indebted my family for the support and encouragement they offered me and for relentlessly guiding and motivating me during the entire research period.

## **DEDICATION**

I dedicate this work to my mother Sauda Nalubega, two daughters Pratharna Birungi Ndagire, Paloma Nassiwa Ikiriza, Peninah Beinomugisha (PhD) and all the family members.



## TABLE OF CONTENTS

ABSTRACT.....	i
DECLARATION .....	ii
COPYRIGHT.....	iii
CERTIFICATION .....	iv
ACKNOWLEDGEMENTS .....	v
DEDICATION.....	vi
TABLE OF CONTENTS.....	vii
LIST OF TABLES .....	xi
LIST OF FIGURES .....	xii
LIST OF APPENDICES .....	xiii
LIST OF ABBREVIATIONS AND SYMBOLS .....	xiv
CHAPTER ONE .....	1
INTRODUCTION .....	1
1.1    Background of the problem.....	1
1.2    Statement of the problem .....	2
1.3    Rationale of the study.....	3
1.4    Objectives of the study .....	4
1.5    Research questions .....	4
1.6    Significance of the study .....	4
1.7    Delineation of the study .....	5
CHAPTER TWO .....	6
LITERATURE REVIEW .....	6
2.1    Conceptual framework .....	6
2.2    Introduction to terms .....	7
2.2.1    Health.....	7

2.2.2	Healthy community.....	7
2.2.3	Traffic officer.....	7
2.2.4	Health officer .....	7
2.2.5	Road traffic fatality .....	7
2.2.6	Healthy urban learning cities/communities .....	7
2.2.7	Road traffic accidents .....	8
2.3	Magnitude and trend of road traffic accidents .....	8
2.4	Factors Associated with RTAs.....	9
2.4.1	Factors influencing exposure to risk.....	9
2.4.2	Risk factors influencing crash involvement.....	9
2.4.3	Risk factors influencing crash severity .....	10
2.4.4	Risk factors influencing severity of post-crash injuries.....	10
2.5	Consequences of road traffic accidents.....	11
2.6	Strategies of community engagement regarding the challenge of road traffic accidents.....	11
2.6.1	Basic elements of the public health approach and Haddon matrix .....	11
2.6.2	Public health approach.....	12
2.6.3	Haddon matrix .....	12
CHAPTER THREE .....		16
MATERIALS AND METHODS.....		16
3.1	Study area.....	16
3.2	Research design.....	17
3.3	Study approach.....	17
3.4	Target population .....	17
3.5	Sample and sampling procedures .....	17
3.5.1	Sample size calculation.....	17

3.5.2	Sampling techniques .....	18
3.6	Data collection methods .....	18
3.6.1	Secondary data sources .....	18
3.6.2	Primary data sources .....	18
3.7	Data management and analysis .....	19
3.8	Study challenges and limitations.....	20
3.9	Reliability and validity of the study .....	20
3.9.1	Data reliability .....	20
3.9.2	Data validity.....	20
3.9.3	Ethical considerations .....	21
CHAPTER FOUR.....		22
RESULTS AND DISCUSSION .....		22
4.1	Demographic characteristics of the participants .....	22
4.2	Road traffic injuries and fatalities in Ilala District from 2014 to 2018 .....	23
4.3	Road users categories involved in RTIs and fatalities in Ilala District, Tanzania (2014-2018).....	26
4.4	Consequences of RTAs in establishing a sustainable healthy urban community in Ilala .....	28
4.5	Strategies of community engagement regarding RTA consequences in Ilala district .....	29
4.6	Readiness of urban authorities in handling RTAs in Ilala district Dar es salaam city .....	34
CHAPTER FIVE .....		38
CONCLUSION AND RECOMMENDATIONS .....		38
5.1	Conclusion.....	38
5.2	Recommendations .....	38
REFERENCES .....		41

APPENDICES .....	47
RESEARCH OUTPUTS.....	60
Accepted research article.....	61
Poster presentation.....	70

## **LIST OF TABLES**

Table 1: Haddon matrix approach implementation .....	13
Table 2: Demographic characteristics of the study participants .....	22
Table 3: Amana Hospital Road Traffic Accident data (Car, bike, Pedal Cyclist).....	25
Table 4: ANOVA for user categories for Road Traffic Injuries.....	28
Table 5: The strategies of community engagement regarding the consequences of road traffic accidents in in Ilala district .....	30

## LIST OF FIGURES

Figure 1:	Conceptual Framework showing the community engagement and readiness of the urban in handling road traffic accidents in Ilala District (Researcher's Conceptualization, 2018).....	6
Figure 2:	The pattern followed by public health for RTAs occurrence from surveillance to Implementation (WHO, 2017) .....	12
Figure 3:	Map of the study area .....	16
Figure 4:	The composition of road traffic injuries and fatalities in Ilala District for 2014-2018 (Traffic Police Data, Dar es Salaam, Tanzania, 2018).....	23
Figure 5:	Distribution of RTA injuries by sex reported at Mnazi Moja Hospital from 2014 to 2018 .....	25
Figure 6:	Trends in injuries by group type in Ilala district from 2014-2018 (Traffic Police Data, Dar es Salaam, Tanzania, 2018) .....	26
Figure 7:	Consequences related to road traffic accidents .....	29
Figure 8:	The readiness of urban authorities in handling road traffic accidents occurring in Ilala district, Dar es Salaam.....	34

## **LIST OF APPENDICES**

Appendix 1: Consent form.....	47
Appendix 2: Questionnaire .....	48
Appendix 3: Kiswahili version .....	53

## **LIST OF ABBREVIATIONS AND SYMBOLS**

DMC	Dangerous Mechanical Condition
DARS	Decades of Action for Road Safety
DIT	Dar es Salaam Institute of Technology
DMDP	Dar es Salaam Metropolitan Development Project
ERSO	European Road Safety Observatory
FGD	Focus Group Discussion
GNP	Gross National Product
IDI	In-depth Interview
IHI	Ifakara Health Institute
IRB	Institutional Review Board
LDCs	Least Developed Countries
LMICs	Least and Middle Income Countries
MAPS	Marrakech action Plan for Statistics
MNH	Muhimbili National Hospital
PMO-RALG	Prime Minister’s Office Regional Administration and Local Government
RAIS	Road Accident Information System
RTA	Road Traffic Accident
RTIs	Road Traffic Injuries
SDG	Sustainable Development Goals
SPSS	Statistical Package for Social Scientists
SUMATRA	Surface and Marine Transport Regulatory Agency
TANROADS	Tanzania National Roads Authority
TPF	Tanzania Police Force
UN	United Nations
WB	World Bank
WHO	World Health Organization



## **CHAPTER ONE**

### **INTRODUCTION**

#### **1.1 Background of the problem**

Road traffic accidents (RTAs) are a major course of global morbidity and mortality, resulting in an estimated 20–50 million road traffic injuries (RTIs) and 1.2 million deaths annually (World Health Organization, 2015). Predictions are that deaths from non-communicable diseases such as RTAs will reach 49.7 million by the year 2020 (WHO, 2018b). Currently RTAs rank 8<sup>th</sup> among the top 10 leading causes of death for all age groups killing more people than HIV and tuberculosis globally (WHO, 2018a). The number of traffic fatalities globally is estimated to be around 1.35 million per year (approximately 3700 deaths per day), and the number of people injured annually as a result of road carnage ranges between 20-50 million (Bonnet, Lechat & Ridde, 2018). Recent statistical projections show that during the period between 2000 and 2020, fatalities related to RTAs would decrease with about 30% in high income countries (Sheth, 2017). For instance, RTA fatalities declined by 27% in the United States and by 63% in Canada from 1975 to 1988 (International Traffic Safety Data and Analysis Group, 2013). Successful interventions such as seat belt safety laws, enforcement of speed limits, warnings about the dangers of drunken driving and safer design and use of roads and vehicles are the major contributing factors to the reduced RTA rates in these countries.

Disproportionately, Africa, mainly sub-Saharan Africa represent the capital for RTA deaths, with 26.6 deaths per 100 000 people, compared to 9.3 deaths per 100 000 people for European Region members (WHO, 2018a). The number of deaths resulting from RTAs was projected to reach 8.4 million by the year 2020 as stated in the Global Impact (Gamble & Gamble, 2009). Despite the fact that these countries are estimated to have only 48% of the world's vehicles, they are reported to account for 90% of RTAs globally (WHO, 2018a). Very recent reports show that in low and middle-income countries (LMICs), high mortalities of up to 26.6 per 100 000 people from RTAs are responsible for economic losses of up to 65 billion dollars USD which is more than all development aid income combined (World Bank, 2018). The rates are quite high compared to 9.3 deaths per 100 000 people for European Region members (WHO, 2018a). Similarly, the risk of road deaths in these countries is estimated at 32.9 per 100 000 inhabitants and is highest in East African region (Fell, Jones,

Mallow, Lema & Mertner, 2017; Kimaro, Mvungi & Kundaali, 2016). A majority RTAs and resulting fatalities are predominant among vulnerable road users like pedestrians, pedal cyclists and motorcyclists (WHO, 2018a).

Similar to the situation in most developing countries, roads are the dominant mode of transport in Tanzania where about 16 211 road fatalities also occur annually (Boniface, Museru, Kilomona & Munthali, 2016). Available reports show that Tanzania is one of the hardest hit countries by RTA deaths at 24.1 per 100 000 people (Kimaro, Mvungi & Kundaali, 2016), and that more than 16 000 lives are lost due to RTAs (Waldon *et al.*, 2018). Interplay of multiple factors is hypothesized to be the underlying causes of this tragedy, into which the current study offers contribution. Several interventions have been implemented to curb RTAs in Tanzania such as driver training, public awareness campaigns, improvement of roads, increasing fines to RTA offenders, setting speed limits, deploying and regular inspection of vehicles by police (Kimaro, Mvungi & Kundaali, 2016). However, recent studies show that the country still suffers massive human and economic losses as well as social and emotional effects from RTAs every year estimated at 800 million dollars and approximately 3% of its Gross National Product (GNP) (World Bank, 2018), and the cost of accidents remains a big threat and burden to Tanzania's capital and human resources. The cost of RTAs in Tanzania was also previously estimated at US\$36 billion (Mobility & Cities, 2002).

Dar es Salaam is one of the major cities and economic hubs in Tanzania with major road networks, and there is a need for analysis of injuries and fatalities from RTAs in the region. The aim of this study was to determine the trends of fatalities/deaths and injuries from RTAs in Ilala district in Dar es Salaam from the year 2014 to 2018 and to assess the effects of road safety measures in reducing RTAs in the district. The study also aimed at evaluating the challenges of reducing RTAs and establishing a sustainable healthy urban community in Ilala district.

## **1.2 Statement of the problem**

According to UN statistics launched in 2018, 55% of the world's population lives in urban areas, a proportion that is expected to increase to 68% by 2050 (WHO, 2018b) With this increase, about 90% of this urban growth will take place in Asia and Africa (UN, 2018). In earlier reports, Africa was the lowest urbanized continent with only 43% of its population living in urban areas (Nations, 2018). However, Africa currently has the fastest urbanizing

rates globally (Smith, 2014). Tanzania is not behind this revolution. The rate of urbanization in Tanzania changed from 24.8% in 2005, and to 31.6% in 2015, and is projected to increase to 38.6% by 2025 (UN-HABITAT, 2016). Currently, about 30% of the population in Tanzania resides in urban areas but with the projected increments, the state of informality characterized by unfavorable living conditions including congested vehicles in the cities, increased traffic injuries and death are expected to increase. Reports show that about 16 211 road fatalities are recorded on average every year in Tanzania (Ministry of infrastructure development, 2009) and generally, the risk of dying from RTAs in Tanzania is estimated at 32.9 per 100 000 inhabitants and is the highest in East Africa (WHO, 2018a)

Dar es Salaam with an annual population growth rate of 4.7% (UN-HABITAT, 2016), is one the fastest-growing urban centers in Sub-Saharan Africa, and will become a ‘megacity’ inhabited by more than 10 million residents by the year 2030 (Levira & Todd, 2017). Unplanned megacities are characterized by a high number of road accident-related fatalities (WHO, 2017) With many vehicles on the city roads coupled with poor inadequate infrastructure, Dar es Salaam is already having a share of accidents. Several factors like infrastructure, inadequate policies, less involvement of communities and low level of research in the area may be pointed out to explain the slow pace in tackling this particular problem. RTAs and associated injuries have not received the attention they deserve in Tanzania. Lack of empirical data and poor quality of the little that exists is probably part of the problem.

### **1.3 Rationale of the study**

Dar es Salaam is one of the major cities and economic hubs in Tanzania with major road networks, and there is a need for analysis of injuries and fatalities from RTAs in the region. Availability of empirical data reveals the magnitude of the problem thus helping to identify the risk factors and target groups so that a scientific approach to prevention and control can be prepared. This study generated empirical evidence that highlight that key challenges and possible mitigations in reducing RTAs in urban Dar es Salaam. These findings will further spark an interest across different stakeholders on this key topical area that require collaborative efforts. In addition, these finding has potential to guide planning and implementation of road safety campaigns by National Road Safety Council.

## **1.4 Objectives of the study**

### **1.4.1 General objective**

The general objective of this study was to assess the challenges of reducing RTAs and establishing a sustainable healthy urban community in Ilala district in Dar es Salaam, Tanzania.

### **1.4.2 Specific objectives**

- (i) To describe and analyze RTAs and fatalities and their trends in Ilala district, Tanzania.
- (ii) To describe and discuss consequences of RTAs in establishing a sustainable healthy urban community.
- (iii) To explore strategies of community engagement regarding the consequences of RTAs in Ilala District.
- (iv) To assess the readiness of urban authorities in handling RTAs occurring in Ilala District Dar es salaam city.

## **1.5 Research questions**

- (i) Is there any significant increase or decrease in the trends of RTAs annually?
- (ii) What are the consequences of RTAs in establishing a sustainable health urban community?
- (iii) What community engagement strategies can be used regarding the consequences of RTAs in Ilala District?
- (iv) Do the urban authorities are ready to handle RTAs in Ilala District?

## **1.6 Significance of the study**

This study therefore aimed to assess the challenges of reducing RTAs and establishing a sustainable healthy urban community in Ilala district. The findings of this study will enrich the RTA literatures, make practitioners be aware of the problems and take appropriate

measures, show readers the severity of the problem so that they will save their lives and livelihoods from loss and destruction, serve as a clue for those researchers who are interested in conducting further studies in the area and finally enable policy makers to design appropriate strategies so that practitioners and other concerned bodies make preventive as well as countermeasures and monitor road safety problems.

### **1.7 Delineation of the study**

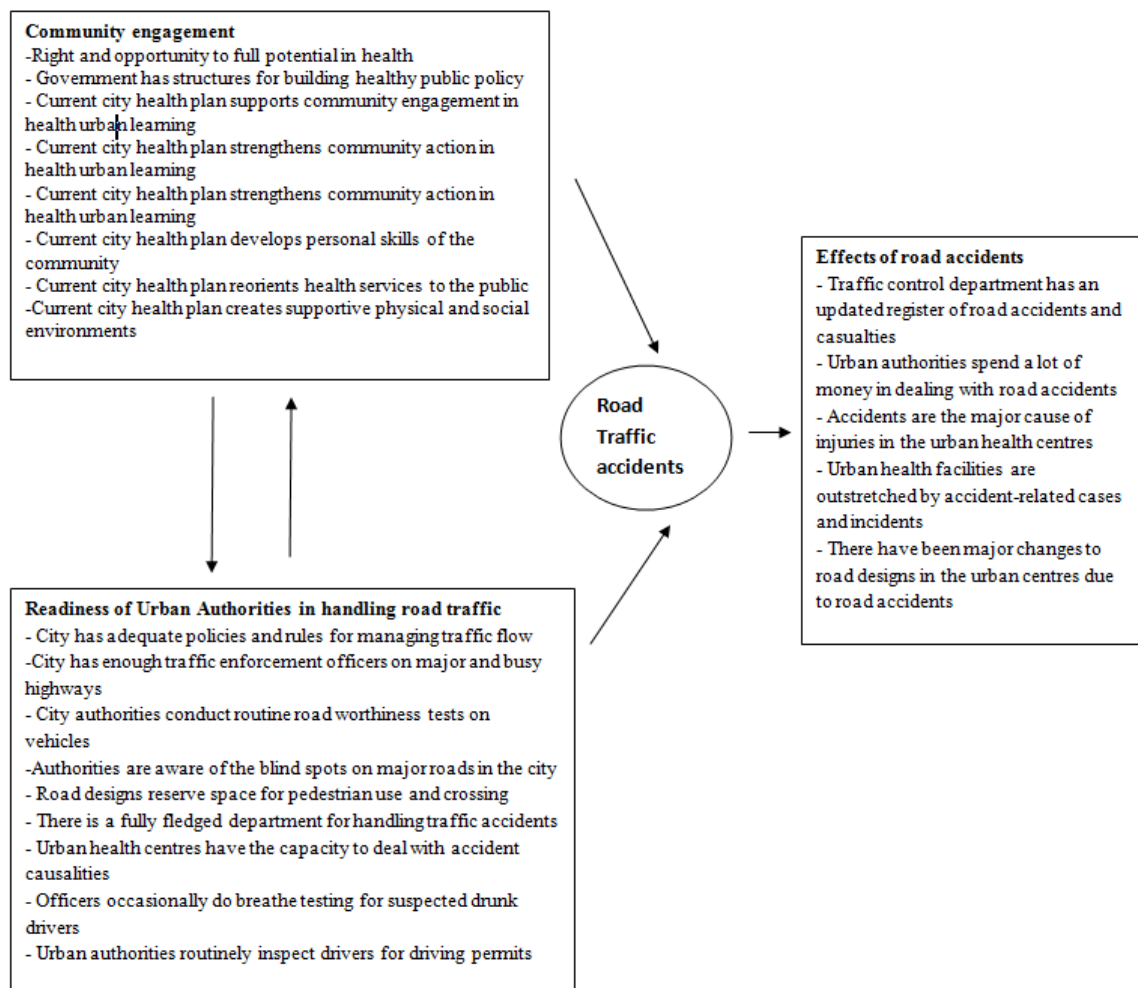
Prior to data analysis, the researcher had to select and formally delineate the geographic boundaries of the study area for effective and accurate data collection. Limiting the study area to Ilala Municipality Dar es salaam region was attractive in that it established an area that matched the study team's available time and resources.

## CHAPTER TWO

### LITERATURE REVIEW

#### 2.1 Conceptual framework

The conceptual framework below indicates that community engagement and readiness of the urban authorities in handling RTAs can directly contribute to reduction in the number of road accidents



**Figure 1: Conceptual Framework showing the community engagement and readiness of the urban in handling road traffic accidents in Ilala District (Researcher's Conceptualization, 2018)**

This eventually brings down the adverse effects of RTAs in form of loss of property, lives, injuries and disabilities.

## **2.2 Introduction to terms**

### **2.2.1 Health**

Health is state of complete physical, mental and social well-being and not merely the absence of disease or infirmity as defined by World Health Organisation constitution (*Constitution of WHO-1948*).

### **2.2.2 Healthy community**

Healthy Community is a complex adaptive system, constantly changing, flexing and evolving. It will emerge from the contributions of professions and disciplines across the board, each recognizing their ability to collaborate and contribute. Healthy communities can also be defined as one in which local groups from all parts of the community work together to prevent disease and make healthy living options accessible.

### **2.2.3 Traffic officer**

A traffic officer is a person whose job is to make sure cars and motors are driven safely and properly for the purpose of safeguarding all users of roads

### **2.2.4 Health officer**

The name of an officer invested with power to enforce the health laws. The powers and duties of health officers are regulated by local laws

### **2.2.5 Road traffic fatality**

Road traffic fatality refers to any person killed immediately or dying within 30 days as a result of road traffic injury.

### **2.2.6 Healthy urban learning cities/communities**

A healthy city continually creates and improves physical, social environments and expands community resources. The importance of understanding hazards, socio-economic and institutional risks for any city marks an important step of adapting disaster and social risk reduction plans. Risk assessment and evaluation is helpful in evaluating probable dangers and vulnerabilities of communities

### **2.2.7 Road traffic accidents**

An accident that occurs on a road or street open to public traffic; resulting in one or more persons being killed or wounded. Therefore, RTA is a smash between vehicles; between vehicles and pedestrians; between vehicles and animals; or between vehicles and geographical or architectural obstacles (Muvuringi, 2012; San, 2013).

### **2.3 Magnitude and trend of road traffic accidents**

The number of RTAs has continued to rise worldwide, with an overall downward trend in road traffic deaths in high-income countries since the 1970s and an increase in many of the LMICs (International Traffic Safety Data and Analysis Group, 2013). Road traffic deaths are estimated to increase by 83% in LMICs, if no major action is taken, and to decrease by 27% in high-income countries. The projection of an overall global increase is 67% by 2020 if appropriate action is not taken (WHO, 2015).

A descriptive cross sectional study carried out in Nigeria among 315 commercial long distance drivers and their vehicles from January 2013 to October 2013 found a 47.9% RTA prevalence. The respondents were recruited using systematic random sampling technique, structured interviewer administered questionnaires and focus group discussions. Most of the accidents were reported to occur in the day time and the common causes of RTAs were identified as careless driving, speed violation, brake failure, traffic violations, faulty overtaking, burst tire and bad roads (Okafor, Azuike & Okojie, 2014).

A research carried out by Barengo (2006) assessed RTAs on gender basis in Dar es Salaam, Tanzania between 1999 and 2001 showed that total number of death cases in RTAs increased by 21% from 1999 to 2001 (296 vs. 375 death cases) and the males had high death prevalences than the females (Barengo & Miettola, 2006). In another study conducted by Boniface (2016), the factors associated with road traffic injuries in Dar es Salaam in comparison to other regions were highlighted, and it was noted that the city had high RTA rates of 115.7 per 100 000 population, while the rates in the coast were 27.6 per 100 000 population and Morogoro had an RTA rate of 23.2 per 100 000 population. Reports show that RTAs have multi-factorial causes including human factors (road users), road and other infrastructure defects, policing inadequacies, environmental elements and vehicle defects and primarily, road users are responsible for many RTAs (Toroyan, Peden & Laych, 2013). As reviewed by Downing *et al.* (2003) studies in different developing countries demonstrated



that human errors account for between 64% and 95% of all RTAs. Further reports show that human factors account for more than 85% of the traffic crashes and injury based on the reports by police (Ostendorf & Retallack, 2019) Over speeding, driving under the influence of alcohol or drugs or while sleepy or tired, driving when visibility is compromised, or without protective gear for all vehicle occupants are major factors in crashes, deaths and serious injuries (Jha, Srinivasa, Roy & Jagdish, 2003).

## **2.4 Factors Associated with RTAs**

World Health Organization in their report on Road Traffic Injury Prevention training manual categorized these factors in four main groups as follows (WHO & WB, 2004).

### **2.4.1 Factors influencing exposure to risk**

These include economic factors such as social deprivation, demographic factors, land use planning practices which influence the length of a trip or travel mode choice, mixture of high-speed motorized traffic with vulnerable road users, insufficient attention to integration of road function with decisions about speed limits, road layout and design.

### **2.4.2 Risk factors influencing crash involvement**

These includes inappropriate speed, presence of alcohol, recreational drugs fatigue, being a young male, being a vulnerable road user in urban and residential areas, travelling in darkness vehicle factors such as braking, handling and maintenance; defects in road design, layout and maintenance which can also lead to unsafe road user behavior, inadequate visibility due to environmental factors (making it hard to detect vehicles and other road users), and poor road user eyesight. As elsewhere in the world, the causes of road accident are faulty vehicles, uneven roads, careless/reckless driving, speeding, drunk driving, inadequate sleep, alcohol and other drug effect and many more. According to a case-control study of 571 drivers involved in road crashes, it was found that driving when sleepy, driving after five hours' or less of sleep, and driving between 2 am and 5 am were associated with a substantial increase in the risk of a car crash resulting in serious injury or death. Such cases are responsible for up to a fifth of all such road crashes. The authors concluded that a reduction in these behaviors may reduce the incidence of injuries or death up to 19%.

### **2.4.3 Risk factors influencing crash severity**

These are human tolerance factors, excessive speed, seat-belts and child restraints not used, crash helmets not worn by users of two-wheeled vehicles, roadside objects not crash protective, insufficient vehicle crash protection for occupants and for those hit by vehicles, presence of alcohol and other drugs.

### **2.4.4 Risk factors influencing severity of post-crash injuries**

These include delay in detecting crash, presence of fire resulting from collision leakage of hazardous materials, presence of alcohol and other drugs, difficulty rescuing and extracting people from vehicles, difficulty evacuating people from buses and coaches involved in crash, lack of appropriate pre-hospital and lack of appropriate care in the hospital emergency rooms.

Studies on road accidents in Ghana reported that lack of adequate personnel capacity in the enforcement agencies constitutes another issue facing the enforcement sector in a lot of developing countries (Mock, Kobusingye, Anh, Afukaar & Arreola-risa, 2005). These included adequate and exact documenting of facts and lack of good data to derive appropriate statistics to inform decision-making. This last point in the case of data collection or availability is highlighted as a drawback in developing countries; a good number of these countries are yet to meet adequately the Marrakech action Plan for Statistics (MAPS), a meaningful statistical data for national programme planning. Another study in Ghana highlighted the causes of road accidents including human or driver errors, vehicle characteristics, traffic infrastructures including engineering design, road maintenance and traffic regulations (Coleman, 2014).

A study in Tanzania reported that the major contributors to road accidents includes drivers' tiredness and sleepiness (SUMATRA, 2007). Also in various studies from other countries, drivers' tiredness and sleepiness plays an important role mainly because of chronic sleep deprivation, irregular schedule changes, sleep disorders due to drivers working conditions (Hammoudi, 2014; Okafor *et al.*, 2014; Wachira, 2008). A study conducted among 5985 road traffic crashes reported the major causes of RTAs as speeding 25.1%, careless driving 21.1%, mechanical defect 14.0%, overtaking 12.0%, crossing pedestrian 10.0%, bad road conditions 6.7%, Intoxication 5.0%, stray animal 4.4%, Crossing cyclist 2.0% and obstruction 0.7% (Barengo & Miettola, 2006).

## **2.5 Consequences of road traffic accidents**

A road traffic injury can result in a fatal or nonfatal injury depending on the intensity and nature of a road traffic crash (Sanyang *et al.*, 2017). There has been an increase in the number of road traffic deaths in low-income countries since 2013 (WHO, 2018a). In 2002, Africa was leading by road traffic mortality rate 28.3 per 100 000, followed by Eastern Mediterranean Region 26.4 per 100 000, South-East Asia 18.6 per 100 000, Western Pacific Region 18.5 per 100 000, European Region 17.4 per 100 000, and America was in the least with low rate of deaths due to RTAs with 16.2 per 100 000 populations. It is also reported that road traffic contributes up-to 23% of all injury deaths worldwide (WHO, 2015).

The consequences of road accidents in Tanzania being high when compared to high income countries with more number of vehicles; these consequences include life threatening effects and mortalities. It's estimated that about 28% of deaths are due to RTAs. Between 1995 to 2000 the number of passenger fatalities per fatal accident prior to the 1994 night driving ban was 0.45 and the average figure for the period 1995-2000 was 0.51. The ratio of passenger injuries per accident was 0.58 in the pre ban period (1990-1994) and this ratio was 0.50 for the period 1995-2000 (SUMATRA, 2007). In addition, RTAs also result into economic losses. A study conducted on road accidents in Tanzanian Mainland reported an annual loss of 25 billion shillings as property loss, treatment expenses and road damage as a result of RTAs (Chiduo & Minja, 2000).

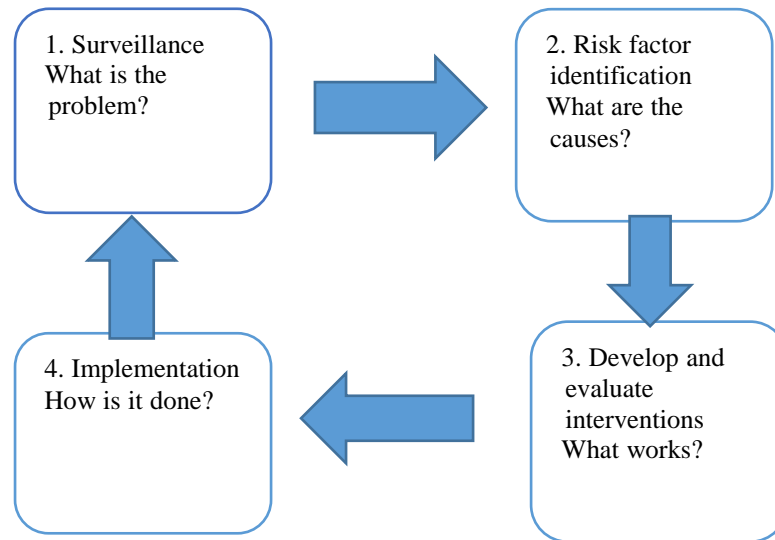
## **2.6 Strategies of community engagement regarding the challenge of road traffic accidents**

### **2.6.1 Basic elements of the public health approach and Haddon matrix**

This section will highlight on different approaches that can be employed during analyses of RTAs. Two ways can be used to analyze and find means to solve arising problems either through Public Health approach or Haddon Matrix. In this section these two approaches have been explained in detail. It is indicated that road safety policies, programs and measures have reduced the numbers and consequences of 'accidents', but they do not necessarily solve risk in communities. This is because it changes the focus from a problem that will go away if we devote enough resources to it, to a situation requiring on-going management. This management of accidents require continued scientific analysis and remedies ensuring that safety resources are well-spent and effectively utilized (Kimberlee, 2011).

### 2.6.2 Public health approach

This was the first approach to be developed and made it possible for different fields of public health to respond to a wide range of health problems and diseases including injuries and violence.



**Figure 2: The pattern followed by public health for RTAs occurrence from surveillance to Implementation (WHO, 2017)**

The public health approach has four steps: to determine the magnitude, scope and characteristics of the problem. These include; identification of the factors that increase the risk of disease, injury or disability, and to determine which factors are potentially modifiable, assessing what measures can be taken to prevent the problem by using the information about causes and risk factors to design pilot test and evaluate interventions and implementation of interventions that have been proven or are highly likely to be effective on a broad scale (WHO, 2016).

### 2.6.3 Haddon matrix

This was developed by William Haddon, this approach follows identification of risks in three phases pre-crash, during crash and post-crash in relation to the person, vehicle and environment as shown in table 1 below (Rustagi, Kumar, Norbu & Vyas, 2017).

**Table 1: Haddon matrix approach implementation**

Phase		Factors		
		Human	Vehicles and equipment	Environment
Pre-crash	Crash prevention	Information Attitudes Impairment Police enforcement	Roadworthiness Lighting Braking Handling Speed management	Road design and road layout Speed limits Pedestrian facilities
Crash	Injury prevention during the crash	Use of restraints Impairment	Occupant restrains Other safety devices Crash protective design	Crash-protective roadside objects
Post-crash	Life sustaining	First-aid skill Access to medics	Ease of access Fire risk	Rescue facilities Congestion

The WHO global status report on road safety (World Health Organization, 2015) reveals that LMICs are the hardest hit, with more than double the fatality rates of high- income countries and 90% of global road traffic deaths. Road users particularly pedestrians, cyclists and motorcyclists make up ½ of these fatalities (Respicious Boniface, Museru, Kiloloma & Munthali, 2016).

Although road traffic injuries have been a leading cause of mortality for many years, most traffic crashes are both predictable and preventable. There is considerable evidence on interventions that are effective at making roads safer. Countries like Switzerland and Netherlands with best practices have successfully implemented these interventions and tremendously reduced road traffic fatalities. Replicating these interventions in other countries offers a huge potential to mitigate future damage and save lives at a global level. Although some interventions from developed countries (such as the road-safety design elements in Denmark and the Netherlands) can be applied in developing-country settings, analysts urge caution because interventions are often situation-specific ( Boniface *et al.*, 2016) Interventions need to be applicable to the particular mix of developing country road use which is dominated by two-wheel vehicles, human-powered vehicles, pedestrians carrying loads, and locally designed vehicles. In addition, the traffic patterns in developing countries (especially in urban areas) are more complex because of high-density living and mixed land use, severe limitation of resources, and the abundance of shantytowns (Andrade *et al.*, 2014).

The United Nations General Assembly recognizing the public health burden of road accidents and injuries adopted a resolution in 2010 that led to the establishment of the Decade of Action for Road Safety (2011–2020). The resolution urges member states to take the necessary steps

to make their roads safer for vulnerable road users. An annual Global status report on road safety is produced by WHO to monitor the situation. The report, serves as a tool to assess the efforts by governments to fulfill Sustainable Development Goal 3.6 on road safety which aims at halving the number of fatalities and injuries on roads globally by 2020 (ERSO - European Road Safety Observatory, 2017).

Motorcycling is for fun, sports and outing in most developed countries. However, in African countries like Tanzania; motorcycles (*bodabodas*) are used as a means of public transport and as a form of employment for many youths. The introduction of *bodaboda* transport in Tanzania in 2007 saw an increase in road traffic fatalities and injuries mainly because many of the riders don't use helmets and rarely observe traffic regulations (Report by Transport Regulatory Authority in Tanzania, 2017). Currently about 1.5 million motorcycles are registered and authorized to carry passengers in Tanzania. These *bodabodas* have been associated with many accidents leading to increased morbidity and mortality in the country. The Surface and Marine Transport Regulatory Authority (SUMATRA) is the government organ in Tanzania responsible for regulating commercial vehicles transport under the Motor Vehicles, Tricycles and Motorcycles Regulations of 2010. The Surface and Marine Transport Regulatory Authority operates in 163 Local Government Authorities in Tanzania and has a fully-fledged section on road safety.

Results from a study by Kinyaga *et al.* (2017) found that crashes occurring between motorcycles and motor vehicles were approximately between 70-80% compared to other studies that reported between 50-55%. Crashes between motorcycles and motorcycles stood at 10% compared to other studies that reported 7%), motorcycles and pedestrian stood at 5% compared to other studies which reported about 10%. For lone motorcycle, the report indicated about 5% compared to other studies which reported about 11% and crashes between motorcycles and bicycles was 5% compared to about 3% reported by other studies.

Laws on key behavioral risk factors for road traffic injuries do not meet best practice in most countries, while enforcement of good laws where they do exist is frequently too weak to allow the potential impact of these laws to be fully implemented. Speed limits and management which is an effective approach to reducing deaths and injuries, is not observed in many developing countries. Road designs don't cater for all road users especially the vulnerable-pedestrians, children, cyclists and the disabled. In general, RTAs one of the preventable risks for road transport in Dar es Salaam and other urban areas in Tanzania, Africa and globally.

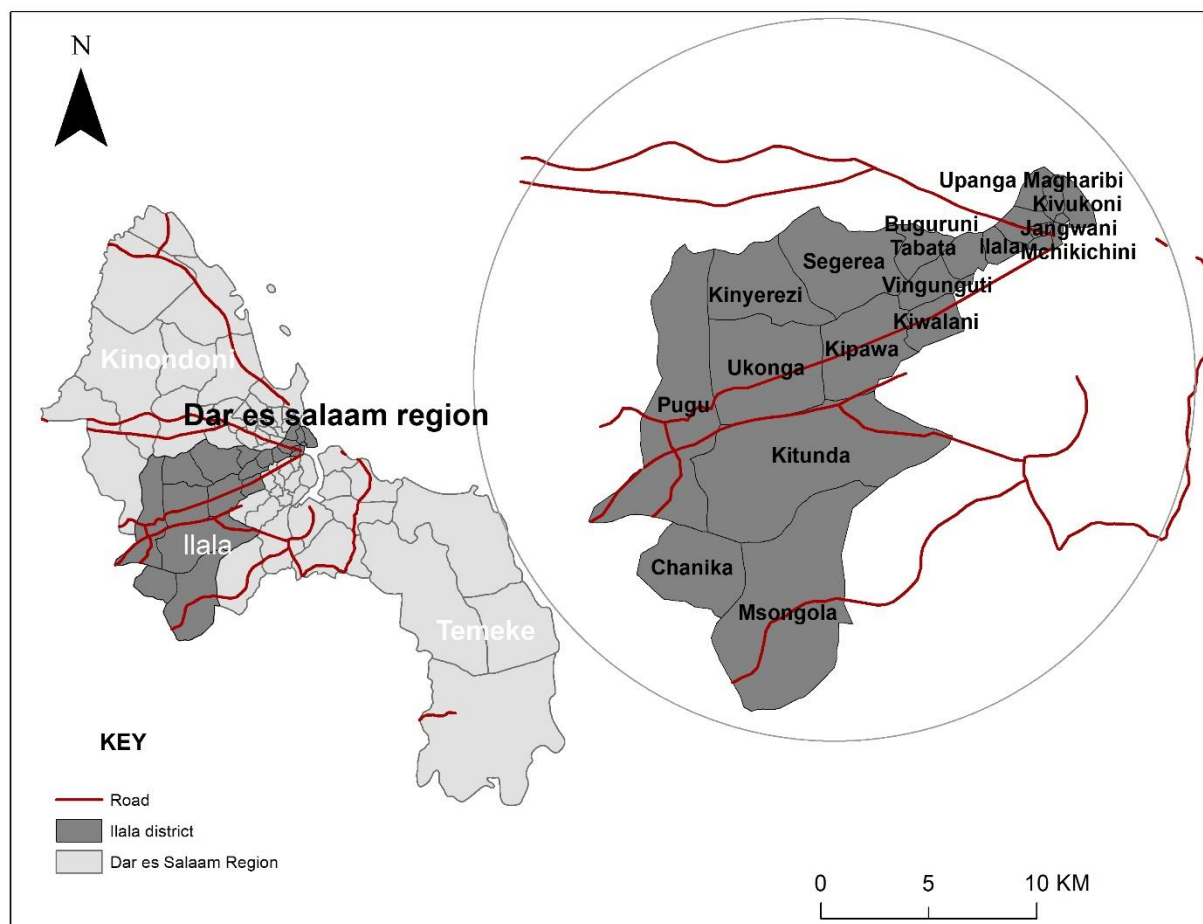
Strict enforcement and adherence to road traffic rules and regulations can curb the number of fatalities and injuries resulting from reckless driving. There should be regular road worthiness tests and frequent inspections to ensure compliance on checking the tendency of alcohol usage to motorcyclists and motor vehicle drivers. Road safety campaigns involving all road users should be periodically carried out to educate and sensitize the masses on road signs and safe road practices.

## CHAPTER THREE

### MATERIALS AND METHODS

#### 3.1 Study area

The study was conducted in Ilala District, Dar es Salaam, which is the largest urban area in Tanzania and the country's chief commercial, economic, industrial and educational, transportation and cultural centre, as well as the country's chief port. The study area is shown in Fig. 3. Dar es Salaam was purposely chosen for this study due to its strategic location, number of vehicles and motor cycles, importance and number of people residing in the city. Within Dar es Salaam, Ilala district was selected as the main study area because it hosts the largest portion of Tanzania's Central Business District and has the highest day and night population in Dar es Salaam region.



**Figure 3: Map of the study area**



### **3.2 Research design**

This study employed a cross sectional analytical study design comprising of quantitative and qualitative methods. The descriptive cross sectional design was employed to explore the ability and capacity of urban authorities to handle emergencies and disasters related to RTAs.

### **3.3 Study approach**

The methodology and procedure for data collection followed a mixed method approach where both qualitative and quantitative methodologies were employed. Interviews, focus group discussions, observations and review of secondary data were essential for this study. The study considers the challenge of RTAs as a complex issue which involves different aspects and requires broader information from different players hence the use of both methodologies was necessary for better results.

### **3.4 Target population**

A target population is any group of individuals, that have one or more characteristics in common and which are of the interest to the researcher. Dar es Salaam city policy makers, police officials, drivers both public and private cars, motorcyclists, pedestrians and medical personnel in hospitals where accident victims are treated and transport licensing bodies like SUMATRA, and Tanzania Roads Authority (TANROADS) were the major focus of this study.

### **3.5 Sample and sampling procedures**

The study used a combination of purposive and simple random sampling techniques in obtaining the respondents that were then given specially designed questionnaires upon consent.

#### **3.5.1 Sample size calculation**

Sample size refers to a number of factors, including the purpose of the study (Israel, 1992). The sampling method proposed by Cochran (1963:75) was adopted to estimate the minimum sample size for the present study. Using this framework, the study captured a sample size that represented at least 10% of the target population as per Central Limit theory. Upon approval of this study and after obtaining the introduction letter, the researcher was able to gain access

to the government records for example traffic data from Tanzania Police Force (TPF), hospitals in Ilala and reports from SUMATRA offices and computed the actual sample of 330 for the study.

### **3.5.2 Sampling techniques**

The above sample size was drawn using purposive sampling procedure. The researcher conducted in-depth interviews and focus group discussions with the respondents believed to be custodians of information on issues related to road traffic management and safety in Ilala district Dar es salaam.

## **3.6 Data collection methods**

According to Cohen, Manion and Marrison (2000) data collection refers to the process of obtaining evidence in a systematic way to ascertain answers to the research problem. There are several methods of collecting data, which depend on the nature of the research. The present study adopted a combination of data collection methods to generate relevant data. The instruments that were employed include interviews, questionnaires and review of secondary data.

### **3.6.1 Secondary data sources**

Secondary data collection was based on quantitative approach that enabled to review records of RTAs at traffic police office. The purpose of secondary data was to provide the necessary information concerning current situation and knowledge of RTAs in the region. A number of sources were used to obtain the secondary data such as reports from traffic police in Dar, reports from Ilala District Hospitals, reports from the National Road Safety Council, and reports from SUMATRA. Data extraction sheets were used to extract the required data from the Traffic Police department's Road Accident Information System (RAIS) and records of accidents reported in the hospitals (Amana and Mnazi Moja) in the defined study period.

### **3.6.2 Primary data sources**

Regarding quantitative data, semi-structured questionnaires were used to collect information from respondents particularly traffic police officers, drivers, cyclists and residents of Ilala Dar es Salaam. Questions comprised of both closed and open-ended style. The semi-structured questionnaires were distributed to a total number of 330 respondents. Interviews were

arranged to facilitate expression of views related to the problem under investigation. Research assistants were trained for one day about the general research project, data collection tools, maintaining privacy and confidentiality, how to ask questions and data quality maintenance. Information was collected from one participant at a time. The research assistants would read aloud one question at a time and wait for participant to reply especially in cases where respondents could not read or write. Key Informant Interviews were scheduled and conducted using an in-depth interview (IDI) guide consisting of a set of questions administered through verbal communication in face-to-face relationship between a researcher and the respondents.

During interviews, the researcher used an audio recorder after obtaining consent from the client. At the same time, the principal investigator would note important themes that were also helpful in report development. The FGDs took 50 – 90 min. Both English and Kiswahili were used when conducting the interviews. Audio recordings during the interviews and discussions enabled the researcher to capture all the required information.

### **3.7 Data management and analysis**

Data collected from the field was cleaned, entered into the computer and analyzed using a statistical software package SPSS 23.0. Descriptive statistics were used to summarize the data, whereas numerical data was summarized using appropriate measure of central tendency and spread. Categorical variables were summarized using frequency tables and percentages. Standard statistical tables were generated to determine the relationship between outcome variables of RTAs, injuries and disabilities with exposure to variables of poor urban planning and infrastructure, reckless driving and failure to observe traffic regulations. The results were then summarized to show trends and patterns of RTAs from the year 2014 to 2018 using graphs. Quantitative findings were presented using figures and tables.

In qualitative research data analysis tends to be an ongoing and iterative (nonlinear) process. The procedures involve interim analysis, data entry, storage, coding and developing category system. The method guiding the analysis was comparative cases and ground theory where researcher compared responses from key informants and came up with themes and concepts related to the topic under study. All FGDs were audio recorded, translated, transcribed and then coded accordingly. The FGDs, and individual interviews from drivers, Traffic Police officers and Ilala district leaders were compared and contrasted for divergent and convergent themes.

### **3.8 Study challenges and limitations**

This research reaffirms that most accident statistics are obtained from routine data collected by traffic police and hospitals. Difficulties were experienced with reviewing the literature. At the time of designing the current study, no published reports were found on assessment of challenges RTAs in establishing a sustainable healthy urban community in Tanzania. The researcher should also have interviewed the RTA victims in hospitals to obtain more information. However, time and financial resources allocated to the study could not allow for this. Nevertheless, these findings still provide important insights on the efforts to reduce and control RTAs in Dar es Salaam city and Tanzania in general. This is in line with the goals of decade of RTA to halve them in all countries by 2020. Securing appointments with police and government officials for in depth interviews was not very easy. At Muhimbili National Hospital (MNH), the researcher was required to submit a full proposal, ethical clearance and a letter requesting for data from MOI ward on road traffic accident victims. The major challenge at MNH was the requirement to pay for another ethical clearance of \$100 despite already having an ethical clearance certificate from Ifakara Health Institutional Review Board. This research used data obtained from Amana and Mnazi Mmoja hospitals since they are the main referral hospitals in Ilala District.

### **3.9 Reliability and validity of the study**

#### **3.9.1 Data reliability**

Data reliability refers to the data collected by independent collector and if the same questionnaire is administered by another person will yield the same results. In the present study, the reliability test was used to determine which factor or item to be analyzed, discussed and used for chi square test. To increase reliability, each respondent was given preamble sample describing the objective of the study and its implications. Respondents were asked to be free and anonymity was preserved.

#### **3.9.2 Data validity**

Data validity refers to correctness and reasonableness of data. The stakeholders' responses were verified for correctness and reasonability. Each questionnaire was checked for validity and if necessary those unfilled questions or invalid selection respondents were asked to specify what actually was the intention. The verified questionnaire responses were then

entered in window IBM SPSS Statistics Version 30 in coded form. This statistical/software package was set with some validation rules for some fields. The entries were printed and verified to ensure that only reasonable and correct entries are captured. All errors were corrected before data analysis.

### **3.9.3 Ethical considerations**

Prior to field data collection, a research proposal was presented to the School of Life Sciences and Engineering – Ifakara Health Institute and the Nelson Mandela African Institute of Science and Technology for approval. Further ethical approval was sought from the Institutional Review Board (IRB) at IHI, and finally an introductory letter and research permit was obtained from Ilala District Administrative Secretary and City Director to enable data collection in Ilala Dar es Salaam region. In order to access police-RAIS, permission was obtained from the Inspector General of police in Tanzania.

All participants were informed of the full nature of the study using an information sheet after which they signed an informed consent to participate in the study. No participants were below 18 years. Privacy and confidentiality was maintained during interviews and participant information was anonymized in the discussion section using participant identity and pseudo names. Participation into the study was on voluntary basis and participants were informed of the right to withdraw from the study at any time without any penalty. For ethical considerations names and photos of all participants were not included in data collection tool and will not appear in the analysis

## CHAPTER FOUR

### RESULTS AND DISCUSSION

#### 4.1 Demographic characteristics of the participants

Table 1 indicates demographic characteristics of the study participants. Among 331 participants, 53.78% (n = 178) were aged between 21 to 30 years and a majority (81.3%, n = 269) of them were males.

**Table 2: Demographic characteristics of the study participants**

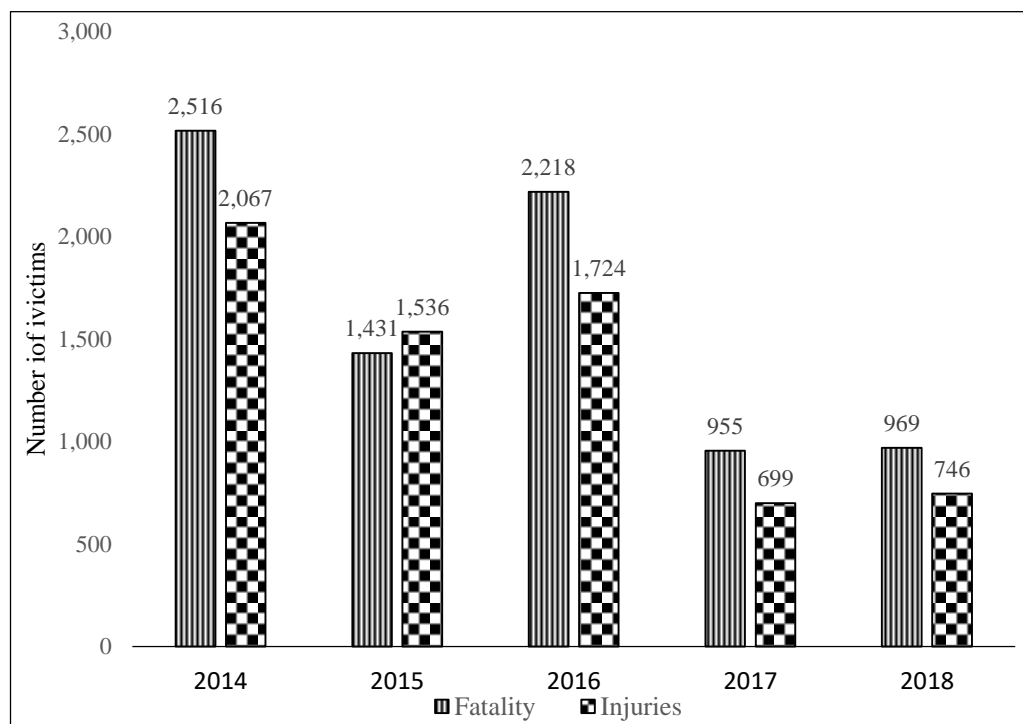
Demographic information		No. of respondents	
		Frequency	Percentage
Sex	Male	269	81.27
	Female	62	18.73
	<b>Total</b>	<b>331</b>	<b>100</b>
Age	18-20years	18	5.44
	21-30years	178	53.78
	31-40	83	25.08
	41-50	41	12.39
	50+	11	3.32
	<b>Total</b>	<b>331</b>	<b>100</b>
Level of Education	Non formal	122	36.86
	Primary	71	21.45
	Secondary	102	30.82
	Tertiary and above	36	10.88
	<b>Total</b>	<b>331</b>	<b>100</b>
Occupation	Driver or Bus Conductor	102	30.82
	Motor Cyclist	100	30.21
	Trader (Business)	46	13.90
	Traffic Police Officer	14	4.23
	Medical Personnel	24	7.25
	Teacher/Lecturer	25	7.55
	Unemployed/Students	20	6.04
	<b>Total</b>	<b>331</b>	<b>100</b>

#### Field Data (2018)

About 36.86% (n = 122) had non-formal education while 30.82% (n = 102) had secondary school education. In terms of occupation, 30.82% (n = 102) and 30.21% (n = 100) were drivers or bus conductors and motorcyclists respectively.

## 4.2 Road traffic injuries and fatalities in Ilala District from 2014 to 2018

A total of 6772 road traffic injuries were reported between 2014 and 2018. The study findings further indicated that road fatalities were highest in the year 2014, road fatalities amounting to 2516, and in the year 2016 there were 2218 road fatalities. Low fatalities (955) as well as minor road injuries (699) within the District were recorded in the year 2017 as shown in Fig. 4. These results indicate a downward trend in the RTAs from the year 2014 to 2018 in the study district.



**Figure 4: The composition of road traffic injuries and fatalities in Ilala District for 2014-2018 (Traffic Police Data, Dar es Salaam, Tanzania, 2018)**

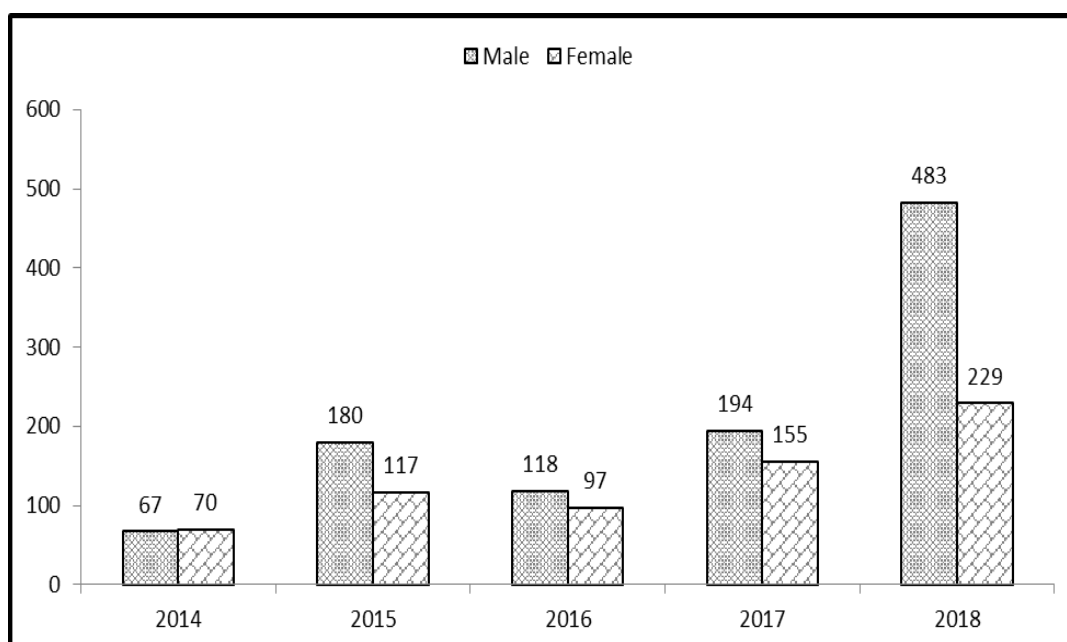
The RAIS records at the Traffic Police Force Headquarters (2014 – 2018) showed that Ilala district had a total of 15 301 accidents between 2014 and 2018 with 2014 registering the highest number of accidents (4729) throughout the study period and the results generally indicated a downward trend. The observed downward RTA trend in the study area could probably be attributed to increased enforcement of traffic regulations and the presence of traffic police officers on the roads as well as intensified road safety campaigns by the National Road Safety Council. For instance, the first and the second road safety campaigns launched in August 2016 to February 2017 and July to December were lauded for this reduction in accidents (Zacharia, 2017). The collaboration of the police force with other bodies such as

Surface and Marine Transport and Regulatory Authority (Fell *et al.*, 2017) could also have contributed to the reduction by ensuring that all road users abided by the traffic regulations. Reports by Mujalli (2018) agree that most measures taken during the period 2010 to 2013 proved to be successful in reducing the RTAs.

However, when interpreting Tanzanian Traffic Police data, it should be noted that Tanzania, like many developing countries, does not have a reliable system for reporting and recording injuries. For instance, in the WHO Global Status Report for Road Safety (WHO, 2013) Tanzania is classified as a 'country without eligible death registration data. Research shows that for every road traffic fatality, at least 20 people sustain non-fatal injuries (Peden, 2004). Thus, the numbers in the TPF data would be far much higher than the obtained data revealed. Nevertheless, the results from this study agree with other reports that also show that there is a global reduction in death rates from RTAs (Toroyan *et al.*, 2013; WHO, 2013). Further reports indicate that there are countries which have indeed successfully managed to reduce the number of deaths on roads, although this may not be the case for others (Hughes, Newstead, Anund & Falkmera, 2015; Steininger & Bachner, 2014). Nevertheless, although the present study showed that RTAs have significantly reduced in the study areas in Tanzania, a very recent report by Kazeem (2019) reveals that death rates from RTAs in Sub Saharan Africa are still higher than anywhere else in the world.

Apart from SUMATRA, data from two referral hospitals in Ilala; Amana hospital and Mnazi Mmoja hospital (Fig. 5). Data from Mnazi mmoja hospital shows an increase of RTAs every year with an increase from 137 in 2014 to 712 in 2018. This implies an increase of more than five times in road traffic injuries reported at Mnazi moja hospital in the period of five (5) years. Considering data collected from Mnazi Moja hospital alone, 1710 injuries were reported between 2014 and 2018. Majority of the cases due to RTAs 61% (n = 1042) were male and 39% (n = 668) were female. Road accident records from Mnazi Mmoja hospital on the other hand indicate an upward trend with a record high of 712 accidents in 2018 where 482 victims were men and 229 were females. This implies a 34.2% increase from the 349 road accidents registered in 2017 as shown in table 5 below. Majority of the victims were children and adults ranging between 5 years to 60 years of age.





**Figure 5: Distribution of RTA injuries by sex reported at Mnazi Moja Hospital from 2014 to 2018**

From the results, a majority of road traffic crash victims were young energetic males in their prime productive years. This is in agreement with findings reported elsewhere in many African countries about trends of TRAs. This group represents the economically active age and portrays an economic lost both to the family and the nation and the reason for their high incidence of road traffic crash reflects their high activity levels and participation in high-risk activities such as recklessness driving/riding, over-speeding, driving/riding under the influence of alcohol and driving/riding without wearing any protective gears. The fact that the economically productive age-groups were mostly involved calls for an urgent public policy response to this public health problem.

Data from Amana hospital indicates a drastic reduction of RTAs victims from 1879 in 2016 to 639 in 2018. This can be attributed to inconsistencies in data recording.

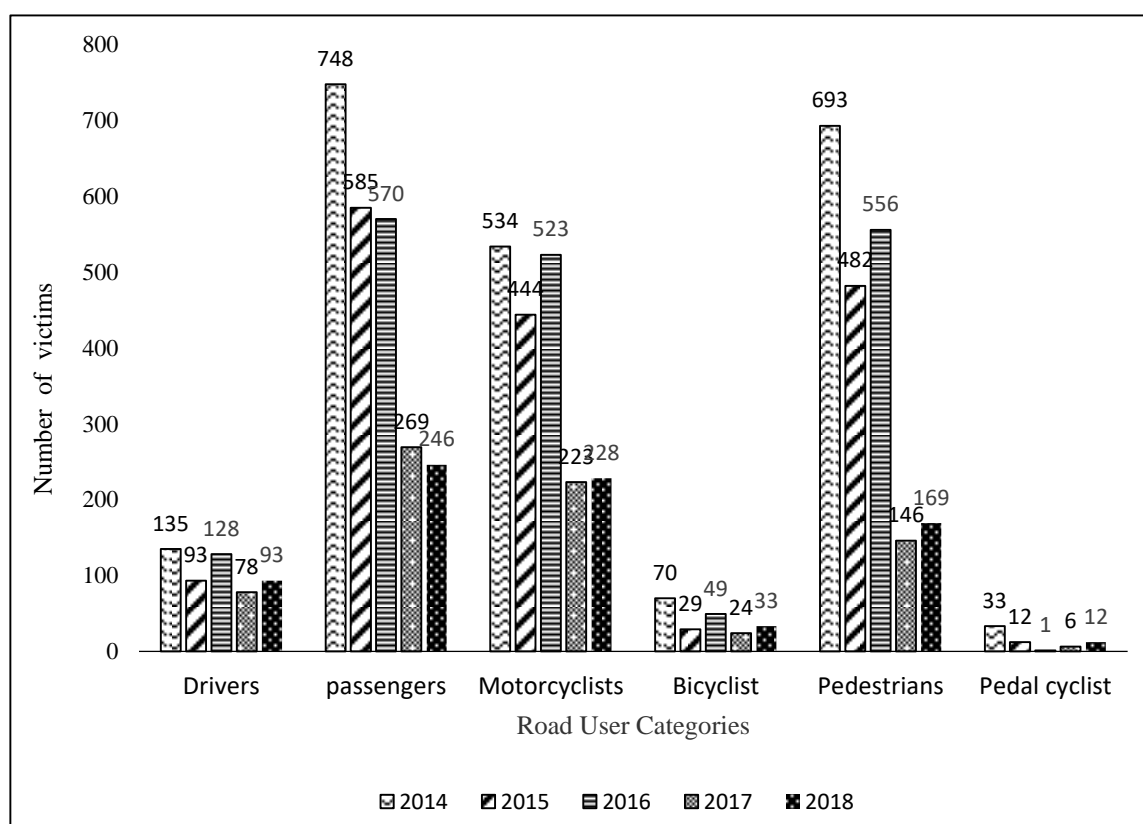
**Table 3: Amana Hospital Road Traffic Accident data (Car, bike, Pedal Cyclist)**

Year	No. of Accidents recorded
2014	0
2015	1258
2016	1879
2017	1166
2018	639

Amana Hospital Trauma Ward records (2009)

### 4.3 Road users categories involved in RTIs and fatalities in Ilala District, Tanzania (2014-2018)

The present study investigated the trends of different categories of road users involved in road traffic injuries and fatalities. Figure 5 shows the distribution among the different road user groups of injuries. Some indication of the order of priorities in road accident prevention can be gained from the distribution of accident injuries among the various road user groups. The data showed that 2418 (33.57%) of the total injuries occurred to the passengers, and pedestrians were the second most frequently affected road users, totaling to 28.41% of the fatalities. This could be attributed to the fact that passengers constitute the majority of vehicle users (Moshiro, 2012; Museru, Leshabari & Mbembati, 2002) and public transport is the daily routine for most of poor Africans (Chen, 2010), and older reports agree that high percentage of passenger fatalities are associated with the utilization of public transport (Odero, Garmer & Zwi, 1997 Chiduo & Minja, 2000; Rwebangira *et al.*, 1996) observed the same distribution.



**Figure 6: Trends in injuries by group type in Ilala district from 2014-2018 (Traffic Police Data, Dar es Salaam, Tanzania, 2018)**

The large number of injured and killed passengers may also be related to the large number of buses, pickups and lorries carrying passengers that are involved in road accidents. These

vehicles are often overloaded and the state of repair leaves much to be desired. The pressure on the operators to achieve their daily targets also contribute to the high casualty rates as the buses are often involved in reckless driving while competing for passengers (Chiduo & Minja, 2000). However, use of public transport is not safe due to lack of seat belts, overloading, speeding and poor road conditions. Likewise, 27.10% (1952) of injuries occur to motorcyclist and the less injured road user groups were drivers (7.32%), bicyclist (2.71%) and pedal cyclists (0.89%). Reports by WHO show that RTAs have multi-factorial causes – human factors (road users), road and other infrastructure defects, policing inadequacies, environmental elements and vehicle defects and that road users are usually primarily responsible for accidents (International Traffic Safety Data and Analysis Group, 2013). As reviewed by Downing *et al.* (1991) studies in different developing countries demonstrated human error estimated to account for between 64% and 95% of all causes of road traffic accidents. Human factor account for more than 85% of the traffic crashes and injury based on the reports by police (Ngallaba, Majinge, Gilyoma, Makerere & Charles, 2013). Driving at excess speeds, while under the influence of alcohol or drugs, while sleepy or tired, when visibility is compromised, or without protective gear for all vehicle occupants are major factors in crashes, deaths, and serious injuries. Thus measures that reduce these accidents could have a big effect on overall accident reduction.

Of greater concern was the large number of pedestrians who constituted the second-highest numbers (28.41%) of the injured and the dead from RTAs. Although disturbing, this finding has consistently been reported in many developing countries (World Health Organization, 2015). Previous studies have established that most of the roads in Dar es Salaam and other parts of Tanzania do not have side pavements for pedestrians or cyclists and sometimes all road users have to crowd on the road (Museru *et al.*, 2002; Waldon *et al.*, 2018) which could be the fuelling factor for injuries to pedestrians from RTAs. Additionally, there are few pedestrian crossing areas, which should be of particular concern to schools in close proximity to highways (Ngallaba *et al.*, 2013; Moshiri *et al.*, 2005; Museru *et al.*, 2002). Public awareness on road use is fairly low and pedestrians are less likely to use walking pavements even when they are available (Museru *et al.*, 2002; Ngallaba *et al.*, 2013). Research from Brazil supports this hypothesis that the lack of pedestrian lanes is associated with high-risk features (Andrade *et al.*, 2014).

Likewise, 27.10% (1952) of injuries occurred to motorcyclists. Some reasons which have been put forward concerning this in the Dar es Salaam region in a very recent study include over speeding, reckless driving, traffic violations and driving under the influence of alcohol (Salum, Kitali, Bwire, Sando & Alluri, 2019). Dar es Salaam being a hugely populated region with > 5 million people has over 300 000 registered motorcycles which are preferred as taxis especially where conventional transportation is uneconomical or physically impossible due to poor road infrastructure (Olubomehin, 2012; Jones *et al.*, 2016; Kumar, 2011). Studies show that motorcycle injuries are among the leading causes of deaths and the main victims are usually motorists, passengers and pedestrians (Peden, 2004). This author reiterates that the risk of dying from a motorcycle accident is 20 times higher than from a motor vehicle. Road users who were least affected by RTAs in all three municipalities were the drivers, bicyclists and pedal cyclists. In a similar study carried out by Museru *et al.* (2002), similar findings were reported where just about 7% and 3% of RTAs were attributed to pedestrians and pedal cyclists respectively.

Looking at the One-way ANOVA (Table 3) for RTIs for the 5 year studied period (2014-2018), it was observed that the variations among the categories of road users were significantly different ( $p < 0.05$ ).

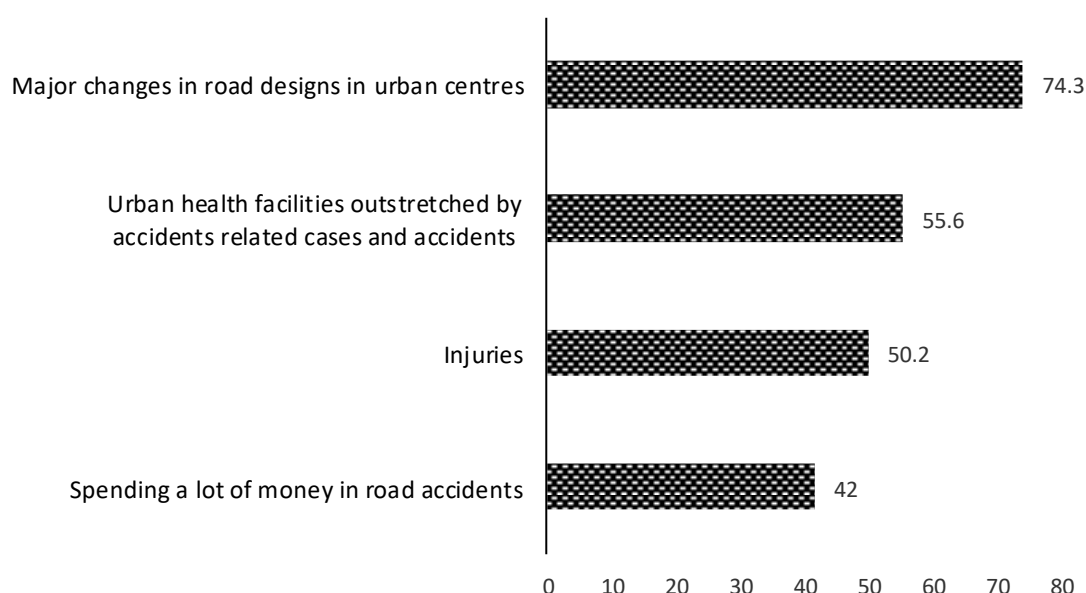
**Table 4: ANOVA for user categories for Road Traffic Injuries**

Source of Variation	SS	DF	MS	F-value	P-value	F critical
Between Groups	1099634	5	219926.8	10.06455	2.74E-05	2.620654
Within Groups	524439.2	24	21851.63			
Total	1624073	29				

#### **4.4 Consequences of RTAs in establishing a sustainable healthy urban community in Ilala**

The study participants reported the consequences related to RTAs. These include major changes in road designs in urban centers (74.3%), over stretched health facilities due to accidents related cases and incidents (55.6%), updated register of road accidents and casualties (55.6%), injuries due to RTAs in urban centers (50.2%), and expenditure of Urban Authorities to deal with RTAs (42.0%).

Road traffic accidents is a critical problem that needs to be addressed seriously. Various countries are suffering from the impacts associated to road accidents. As noted by Awal (2013) of which this study agrees with, the problem of deaths and injury as a result of road accidents is now acknowledged to be a global phenomenon. As a result, authorities in virtually all countries of the world are now concerned about the growth in the number of people killed and seriously injured on their roads including Tanzania. Motor vehicle registration in Dar es Salaam is increasing rapidly as the population grows contributing to a rise in the number of RTIs and fatalities (SUMATRA, 2017).



**Figure 7: Consequences related to road traffic accidents**

Road traffic accidents have become ‘hidden epidemics’ across the world and have posed a substantial health and economic burden to many developing nations (Ngallaba *et al.*, 2013). Investigations by Rwebangira (2010) showed that RTAs cost the less developed countries (LDCs) around US\$ 230 billion, with the cost to a sum that they can ill afford. Experiences drawn from other countries suggest that RTAs have serious economic impacts. For example, in Mexico and India, road accidents cost approximately US\$ 2.5-3.2 billion per annum, in South Africa and Pakistan, US\$ 0.5-1.0 billion and in Zimbabwe and Kenya, US\$ 55-70 million per year and LDCs, around US\$ 36 billion.

#### **4.5 Strategies of community engagement regarding RTA consequences in Ilala district**

Table 3 indicates the strategies of community engagement towards the consequences of RTAs.

Among 331 participants the response to the strategies include current city health plan that creates supportive physical and social environments (61.3%, n = 203); the current city health plan reorients health services to the public (42.6%, n = 141); the current city health plan develops personal skills of the community (37.2%, n = 123); the current city health plan strengthens community action in health urban learning (36.3%, n = 120); people have the right and opportunity to realize their full potential in health in receiving health services (32.6%, n = 108); the current city health plan supports community engagement in health urban learning (27.8%, n = 92); the government has structures for building public health policy (27.2%, n = 90).

**Table 5: The strategies of community engagement regarding the consequences of road traffic accidents in in Ilala district**

Strategies	Response		
	Response	Frequency	Percentage (%)
The government has structures for building public health policy	Disagree	100	30.2
	Neutral	141	42.6
	Agree	90	27.2
The current city health plan supports community engagement in health urban learning (Dar es salaam has a City Health Plan)	Disagree	94	28.4
	Neutral	145	43.8
	Agree	92	27.8
The current city health plan strengthens community action in health urban learning	Disagree	68	20.5
	Neutral	143	43.2
	Agree	120	36.3
The current city health plan develops personal skills of the community	Disagree	43	13
	Neutral	165	49.8
	Agree	123	37.2
The current city health plan reorients health services to the public	Disagree	33	10
	Neutral	157	47.4
	Agree	141	42.6
The current city health plan creates supportive physical and social environments	Disagree	25	7.6
	Neutral	103	31.1
	Agree	203	61.3

During the FDGs, one participant revealed that:

*There is an importance of involving the community in different issues related to health and road accidents because these are the stakeholders. For example you have come here to conduct research so another person should also come and give seminar for one or two hours, I think that will help a lot in understanding road safety rules and this will decrease the number of road traffic accidents.*

Another participant revealed that:

*It is important to involve the community but also take into consideration whether the community is serious, for example all motor vehicles and motorcycles have insurance but if a person is involved in an accident or a student has been knocked down, if you take him to the hospital the parent is supposed to pay for the medical costs, I think that the insurance for the motorcycle or motor vehicle should also cover the medical costs if one is involved in an accident.*

It was also perceived that if the community was educated and involved, they will be the first ones to implement the laws.

A participant revealed that:

*People from the city council do not work as experts, for example if you go to the city center without a permit, they arrest you ruthlessly. When we are looking for income maybe at Kariakoo, we are not in a safe environment. My suggestion is for the government and leaders to create an environment where we can have health insurance.*

On perceptions on what to do when involved in an accident, it was revealed that there are motorcycle insurances in case of accidents, but they do not cover the medical expenses. The suggestion was that they should be given more information about health insurance and police officers should be careful with the mobile phones especially car drivers who use phones to chat and call while driving. Another participant revealed that education on road safety rules should be considered and the police should avoid being engaged in corruption.

*Education on road safety should be observed and also a large number of the police officers care about money once they find someone has broken the rules, they take*

*money without issuing receipts. Before the police officers take the money, they put someone in lock up, that is not the solution but rather the drivers should be taught.*

Another participant revealed that most Tanzanians are afraid but this is because they don't know the rules, so education on road safety rules should be given to enable them know when they make mistakes or not.

When asked about the way forward to reduce RTAs, the respondents revealed that drivers should be very careful, follow road safety procedures and should not use alcohol or anything that might impair their judgments while on the roads. One participant revealed that:

*“If we follow the road safety rules then we will help in reducing RTAs, if you observe the traffic lights, zebra crossing and pedestrians then we will reduce RTAs”.*

It is also the duty of the passenger or the citizen to tell the driver to drive at a low speed in case she sees that the driver is driving at a high speed. For instance, while travelling and the driver is over speeding, it is the responsibility of the passengers to tell him to slow down. Participant number one also revealed that lack of education to people might be a challenge because you might be involved in an accident and some people come there and argue without knowing the source of the accident. Participant number five revealed that the motorcycle drivers are always scapegoats.

*In the case of motorcycle drivers, even if an accident has been caused by someone else, people say that it has been caused by a bodaboda driver because they hate us and this is because some of us drive at a high speed and are involved in robbing people so we are requesting the government to care for us because this work is our source of livelihood. This work is like any other work but the government is not involved, I am even surprised that you have come to talk to us because most of us are hated by the government and citizen and we are not treated fairly.*

Participant number six revealed that RTAs is a big challenge and lacks supervision. For example, when an accident occurs, instead taking care of the person who was involved in the accident, people start taking photos of the incident using their smart phones.

*Road traffic accidents lack proper supervision, when an accident occurs, the first thing is to look after the person who has been hurt but due to the fact that a majority of*



*Tanzanians own smart phones, you find that instead of providing support to the person who has been hurt they start taking photos of that person. What I can say is that when I was young the government had special people in the health sector, when these people saw an accident, they would rush and give first aid, and rush injured person to hospitals. For example, an accident happened here three days ago around Mafia and Msimbazi street, a young child was crossing the road and the rapid transit bus was passing, the child was knocked down by the car and was hurt so the citizens who were present started taking photos of the incident instead of taking the child to the health facility, so I took the child and took him to the police station to get PF3 and go to the hospital. What I can say is that we currently don't have supervision of our health, if it is possible our government should have special people for that work or there should be phone numbers which we can call to assist with those who are injured in accidents to reach hospitals.*

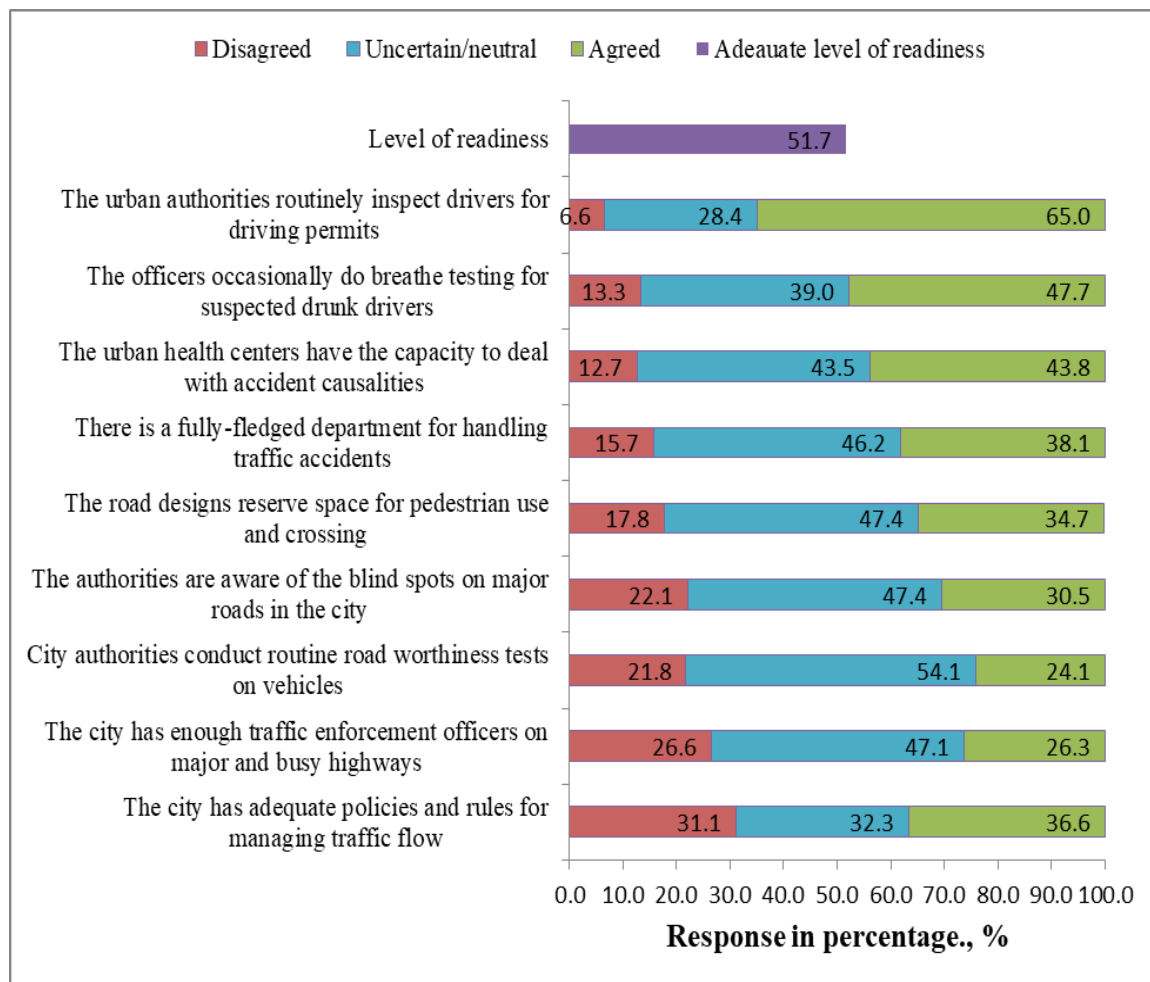
In March 2014, the Traffic Police Commander banned *bodabodas* from entering and operating in Dar es Salaam City Centre, citing the increase in motorcycle-related criminal activities. Armed police set up checkpoints on the edge of the city center, blocking all *bodabodas*. Those drivers who did enter had their motorcycles seized and taken to the nearest police stations, where they had to pay a Tsh 30 000 fine before the motorcycle was released (Bradbury, 2015). On the other hand, many *bodaboda* drivers consider themselves to be the victims of crime, and some have developed ways to protect themselves.

An article published in *Mwananchi* newspaper (9<sup>th</sup> February 2015) claimed that at some *bodaboda* stands (the unofficial locations where groups of *bodaboda* drivers gather waiting for customers), drivers have appointed members as '*Bodaboda Police*', to protect themselves from theft and assault. The article cited *bodaboda* drivers said that they needed protection from drivers of other vehicles, including *daladalas* (minibus taxis), who deliberately try to knock them down. It also cited cases of drivers being robbed and murdered by passengers. Claiming self-defense, if a *bodaboda* driver is hit by another vehicle, his fellow *bodaboda* drivers will be informed and will rush to the scene, and attack the vehicle drivers. The behavior of road users depends on the roadway design features, traffic flow characteristics, traffic stream composition and traffic control elements. The general rules and legislation, which contains sufficient amount of information to regulate, warn and guide the traffic, determines desired efficiency and safety of road users. Traffic control devices, such as signs,

signals and markings, regulate, warn and guide the traffic. Thus, traffic control devices form an important part of the road transport infrastructure (Neil, Transaid & Transaid, 2016).

#### 4.6 Readiness of urban authorities in handling RTAs in Ilala district Dar es salaam city

Figure 7 shows responses in percentage of the different participants. The readiness of urban authorities in handling RTAs scored 51.7%.



**Figure 8: The readiness of urban authorities in handling road traffic accidents occurring in Ilala district, Dar es Salaam**

This percentage originates from the level of score of the participants' responses on readiness of urban authorities to handle RTAs. A majority of the participants (65.0%, n = 215) agreed that the urban authorities routinely inspect drivers for driving permits followed by the officers occasionally do breathe testing for suspected drunk drivers (47.7%, n = 158). Other measures of readiness included capacity to deal with accident casualties (43.8%), fully-fledged department for handling RTAs (38.1%), availability of adequate policies and rules for

managing traffic flow (36.6%), reserve space for pedestrian use and crossing (34.7%), authorities aware of the blind spots on major roads in the city (30.5%), the city having enough traffic enforcement officers on major and busy highways (26.6%), city authorities conduct routine road worthiness tests on vehicles (24.1%). On average, 54.1% of the respondents were uncertain and remained neutral on the issue of city authorities conducting regular road worthiness tests on vehicles in Ilala district.

During an IDI with one of traffic police officers at the headquarters it was revealed that human resource constraints in the police force cannot enable officers to man all city roads. There is need for the community to have a culture of respecting laws Inspector of police revealed that:

*I can't say we have enough laws related to road safety and those available, some need revision. At the moment, the fines that are imposed by the government seem very small for instance twenty up to fifty thousand shillings can simply be paid by most of the drivers.*

Inspector of police revealed that:

*"Road users do not have a habit to follow or respect laws until when you tell them we are going to put you in jail/lockup".*

The traffic officer believed that if every individual would be responsible and respect the laws related to road safety the result will contribute on reducing road accidents hence addressing the problem.

During an interview with a driver:

*I am requesting the government to solve this problem, there should be a vehicle advertising about road safety, we know that the developments are for all of us such as the hawkers being given identity cards is also our development but the main challenge is for the pedestrians from Msimbazi to Kamata, so I am requesting the president of the United Republic of Tanzania to help with road safety, they should be visiting at least once per week and educating about road safety because a majority of Tanzanians lack education we don't know what the traffic lights mean.*

Other respondents advised that, for effective and efficient functioning of traffic control devices, it is important to ensure that the devices used are uniform. To ensure uniformity,

there is need for the recognition of legislation, regulation and a manual for traffic control devices as guiding tools for authorities in charge and road users as well, they added. The devices should also be compatible with regional and international standards. The recognition and realization of above deficiency necessitates the Manual for Uniform Traffic Control Devices to be used within Tanzania. The Manual is approved by the Minister responsible for roads in accordance with Traffic Control Devices Regulations, 2006 under the Road Act No. 30, and is recognized as the national standard for Traffic Control Devices on all public roads.

During an SGD, participant number one reveals that:

*Our roads contribute to different challenges, for example as my colleagues said you might be riding and motorcycle and you are on the right direction but you get involved in an accident with a car coming from another direction and at the end of the day you start arguing with the vehicle driver. Also, when you are involved in an accident and go to the hospital there is a problem in receiving you.*

Furthermore, participant number three reveals that road signs should be observed and followed. For example, there are vehicles which park along the roadside or has parked at the corner so you can't see who is coming from the other side and you might be involved in an accident. Participant number three reveals that:

*"There are cars which park along the road and they are not allowed to park there, such kinds of challenges lead to accidents so you might find that you have a broken hand or leg".*

When asked a question about perception on how population density contributes to a health and sustainable community, participant number six revealed that population density contributes to road accidents due to the fact that a big percent of Tanzanians do not have enough education on road safety. While, participant number six reveals that:

*A big percent of Tanzanians whether the owners of automobiles or the pedestrians do not have enough education of road safety, for example today on the 29<sup>th</sup> I was coming from Fire and heading to Dar es salaam Institute of Technology (DIT), at DIT there is a junction which the traffic lights permitted to enter Bibi Titi street but the pedestrian did not wait and crossed the road so I had to stop and wait, so these are the challenges which reduce RTAs.*

Participant number two revealed that:

*People do not follow the laws especially the pedestrians, there are road signs which are for the pedestrians, for example the traffic lights which allows the pedestrian to cross or the vehicle or motorcycle to cross so it is a rule for the drivers to stop so that the pedestrians can cross but these pedestrians do not follow the rules. You might find that the traffic light is green meaning that the pedestrian should stop to allow the vehicle or motorcycle to cross, but you find that the pedestrian crosses without following the rules, accidents occur that way.*

Participant number five revealed that the pedestrians should be educated about road safety and the procedures on how to cross the roads. Projections indicate that urbanization as the gradual shift in residence of the human population from rural to urban areas, combined with the overall growth of the world's population could have an increase of 2.5 billion people to urban areas by 2050. It appears that if the road user always maintained their vehicles adequately and behaved correctly within the limitations required for good and bad road infrastructure, traffic and environmental circumstances, then accidents would indeed be reduced (Neil *et al.*, 2016). Road transport is very crucial for the movement of goods and people which tremendously contributes to economic growth and sustainable development. The road transport system though very vital is known for the occurrence of fatal and tragic road accidents, which has resulted in loss of lives, property and millions of people injured and disabled annually (WHO, 2018b).

## **CHAPTER FIVE**

### **CONCLUSION AND RECOMMENDATIONS**

#### **5.1 Conclusion**

This research assessed the trends of RTA in Ilala District Dar es salaam City from 2014 – 2018. A cross-sectional study design was employed and descriptive statistics to describe the data. Based on secondary accident data together with primary field data collected, explanatory, the reasons assigned for timely handling of accidents, community engagement and effects of road accidents were tested using chi square and these variables age, occupation, education and location were found to be statistically significant. The study concludes that there is an urgent need to address road carnage which has turned out to be endemic on the city roads. Most accidents fatal and non-fatal are preventable because they arise from human errors.

Road traffic accidents constitute a huge public health problem which is a man-made disaster. The situation will worsen unless prevention strategies are adopted. There is hope to avoid such losses of lives, wealth and property by setting road safety actions. A scientific approach to the issue is essential in every city, so that road safety policies could be founded on reliable data, and meeting financial resources of each region. In assessing the challenge of road RTAs in Ilala and Dar es Salaam in general, this study concludes that; RTIs are a major but neglected public health problem that requires concerted efforts for effective and sustainable prevention. of all the systems with which people have to hustle every day, road traffic systems are the most complex and the most dangerous. The associated consequences identified by the study are such as, death, injuries, disabilities, loss of property and psychological problem as well as poverty. Though statistics indicate a decline in RTAs, a lot needs to be done to attain the recommended figure by WHO which is halving the current RTAs by the year 2020. Concerted efforts are required by all stakeholders to step up road safety campaigns, observe road regulations and strengthen the enforcement units particularly traffic police on to of improving and maintaining road construction by TANROADS and other responsible agencies.

#### **5.2 Recommendations**

The following recommendations are proposed for consideration to add on the efforts of reducing and controlling RTAs in Ilala District, Dar es Salaam city:

- (i) The National Road Safety Council and TANROADS should erect road signs and warning signals on all roads, construct bumps at appropriate locations and remove all unauthorized bumping on the roads. More efforts are required for routine road maintenance and proper road design labels. The absence of road maintenance puts road users at a high risk for traffic injuries.
- (ii) The police should carry out regular road worthiness tests on all vehicles to reduce the number of public service vehicles that are in dangerous mechanical conditions (DMCs). Our study found that only 21% of respondents had witnessed city authorities conduct routine road worthiness tests in Dar es Salaam city. This area needs to be strengthened.
- (iii) SUMTATRA and TPF should ensure that all commercial and public service vehicles have protective gears like air bags and seatbelts among others. Drivers should be inspected routinely for driving permits.
- (iv) All accident cases whether fatal or non-fatal should be reported to the nearest police station so as to update the police (RAIS) in order to use such accident records for designating black spots and coming up with preventive strategies to reduce road carnage.
- (v) All responsible players especially TANROADS, SUMATRA and TPF should work together to ensure that all road users are safe when driving, biking or walking.
- (vi) Road safety campaigns should be an ongoing activity to engage, sensitize and educate the public on traffic rules, regulations and observation of road signs by all road users. Such public empowerment will encourage passengers and road users to be whistleblowers in face of reckless and over speeding drivers. Public awareness campaigns should be used to sensitize the general public, including all road users on the problem of RTAs and the need to observe traffic regulations. This can be done by all members of the National Road Safety Council. Currently the government is implementing a six months road safety campaign in the whole of Tanzania. According to TANROAD's Manager of Road Safety, scheduled public awareness campaigns have been halted in favor of the six months long campaign.
- (vii) There is need to learn best practices from other countries that have managed to

control and drastically reduce RTAs both in Africa and other continents. Sweden, Netherlands and England offer the best example in Europe while Algeria and Morocco have the best practices in Africa where road carnage has been consistently dealt with and fatalities kept below 18 per 100 000 inhabitants.

- (viii) Road safety should be every one's responsibility because accidents are not selective and they affect all classes of people. Recommendations of World Road Status Report and Decade of RTAs Campaign to curb road carnage should also be considered and implemented.



## REFERENCES

- Abegaz, T., & Gebremedhin, S. (2019). Magnitude of road traffic accident related injuries and fatalities in Ethiopia. *PLoS One*, 14(1), 1-10. <https://doi.org/10.1371/journal.pone.0202240>
- Barengo, N., & Miettola, J. (2006). Road traffic accidents in Dar-es-Salaam, Tanzania during 1999. *International Journal of Injury Control and Safety Promotion*, 3(4), 1–5.
- Boniface, R., Museru, L., Kiloloma, O., & Munthali, V. (2016). Factors associated with road traffic injuries in Tanzania. *Pan African Medical Journal*, 23(1), 1–7. <https://doi.org/10.11604/pamj.2016.23.46.7487>
- Boniface, R., Museru, L., Kilomona, O., & Munthali, V. (2016). Factors associated with road traffic injuries in Tanzania. *Pan African Medical Journal*, 23(2), 24-35.
- Bonnet, E., Lechat, L., & Ridde, V. (2018). What interventions are required to reduce road traffic injuries in Africa? A scoping review of the literature. *Journal of PLoS One*, 13(11), 1–20. <https://doi.org/10.1371/journal.pone.0208195>
- Bradbury, A. (2015). *Tanzania imotorcycle taxi rider training: Assessment and development of appropriate training curriculum Final report Transaid May 2015*. [www.transaid.org](http://www.transaid.org)
- Chen, G. (2010). Road traffic safety in African countries- status, trend, contributing factors, countermeasures and challenges. *International Journal of Injury and Safety Promotion*, 17(4), 247–255.
- Chiduo, C. W., & Minja, P. (2000). Road safety in Tanzania: What are the problems? Technology transfer in road transportation in Africa: Arusha International Conference Centre, Tanzania, May 23-25, 2001. Conference proceedings, p. 234-246.
- Coleman, A. (2014). Road traffic accidents in Ghana: A Public Health concern, and a call for action in Ghana. *Open Journal of Preventive Medicine*, 10(11), 1–9.
- De-andrade, L., Vissoci, J. R. N., Rodrigues, C. G., Finato, K., Carvalho, E., & Pietrobon, R. (2014). Brazilian road traffic fatalities: A spatial and environmental analysis. *PLoS ONE*, 9(1), 1-7. <https://doi.org/10.1371/journal.pone.0087244>, 1-24.

- Fell, M., Jones, A., Mallow, P., Lema, E., & Mertner, J. (2017). Improvement of Road Safety in Tanzania Mainland. *Surface and Marine Transport Regulatory Authority*, 5(2), 1-18.
- Gamble, A., & Gamble, B. (2009). The global impact. *The Spectre at the Feast*, 114–140. [https://doi.org/10.1057/978-1-137-51047-1\\_6](https://doi.org/10.1057/978-1-137-51047-1_6)
- Kimaro, M., Mvungi, K., & Kundaali, N. Y. H. (2016). Challenges in the management of road safety in Tanzania: The need for an integration framework. *Huria Journal*, 22(12), 48–58.
- Hammoudi, A. A. (2014). *Causes and strategies to reduce road traffic accidents in Abu Dhabi*. <https://pdfs.semanticscholar.org/04ee/39438e10e51cf7a0987f90528b6b4c4ebb3b.pdf>
- Hugh, W. S. (2014). Urbanisation in Tanzania a density-based measure of ‘urban’ for Tanzania? Feasibility study using Dodoma region. *Journal of Population Growth*, 41(4), 1967–2012.
- Hughes, B. P., Newstead, S., Anund, A., & Falkmer, T. (2015). A review of models relevant to road safety. *Accident Analysis and Prevention*, 74(1), 250–270.
- International Traffic Safety Data and Analysis Group. (2013). *International Transport Forum: Road Safety Annual Report 2013*. Retrieved from [www.internationaltransportforum.org](http://www.internationaltransportforum.org)
- Israel, G. D. (1992). *Determining sample size degree of variability. Programme evaluation and organisation development*. Institute of Food and Agriculture Sciences (IFAS) University of Florida, Gainesville 32611.
- Jha, N., Srinivasa, D. K., Roy, G., & Jagdish, S. (2003). Injury pattern among road traffic accident cases : A study from South India. *Indian Journal of Community Medicine*, 28(2), 85–90. <https://doi.org/10.1158/1078-0432.CCR-15-3086>
- Jones, S., Tefe, M., Zephaniah, S., Tedla, E., Opoku, S., & Walsh, J. (2016). Public transport and health outcomes in rural sub-Saharan Africa: A synthesis of professional opinion. *Journal of Transport and Health*, 3(1), 211–219.
- Kimberlee, R. (2014). Road wars: Contesting paradigms of road safety, public space and well-being. In S. Maile, & D. Griffiths (Eds.). *Public Engagement and Social Science*, 113-126. Policy Press <http://www.policypress.co.uk>

- Kinyaga, B. (2017). Road accidents in urban and rural areas: Case study of motorcycle accidents in Dar Es Salaam , Tanzania. *Southern African Transport Conference*, 59(5) 512–520.
- Kumar, A. (2011). *Understanding the emerging role of motorcycles in African cities: A political economy perspective* (Sub-Saharan Africa transport policy program (SSATP) discussion paper No. 13). Washington DC: World Bank.
- Levira, F., & Todd, G. (2017). Urban health in Tanzania: Questioning the urban advantage. *Journal of Urban Health*, 94(3), 437–449. <https://doi.org/10.1007/s11524-017-0137-2>
- Ministry of infrastructure development. (2009). The United Republic of Tanzania: National Road Safety Policy. *Journal of Public Policy*, 45(12), 108–117.
- Mobility, U., & Cities, T. (2002). Sub-Saharan Africa transport policy program the world bank and economic commission for Africa Addis Ababa Dar es Salaam Nairobi: *Study Urban Mobility in Three Cities*. <http://documents.worldbank.org/curated/en/604221468313218556/pdf/273240PAPER0SS110Scoping0Study1web1.pdf>
- Mock, C., Kobusingye, O., Anh, L. V., Afukaar, F., & Arreola-risa, C. (2005). Human resources for the control of road traffic injury. *Bulletin of the World Health Organization*, 83(4), 1–8.
- Moshiro, C., Heuch, I., Astrom, A. N., Setel, P., Hemed, Y., & Kvale, G. (2005). Injury morbidity in an urban and rural area of Tanzania: An epidemiological survey. *BMC Public Health*, 28(5), 11–21.
- Moshiro, R. (2012). Risk factors associated with injuries among children below 18 years attending health facilities in Dar Es Salaam, Tanzania. *MMed Pediatrics and Child Healthn Dissertation*, 14–70. Retrieved from [http://ir.muhas.ac.tz:8080/jspui/bitstream/123456789/668/1/ready for hard copies.pdf](http://ir.muhas.ac.tz:8080/jspui/bitstream/123456789/668/1/ready%20for%20hard%20copies.pdf)
- Mujalli, R. O. (2018). Modelling risk of road crashes using aggregated data. *Jordan Journal of Civil Engineering*, 12(1), 45–60.

- Museru, L. M., Leshabari, M. T., & Mbembati, A. A. (2002). Patterns of road traffic injuries and associated factors among school-aged children in Dar es Salaam, Tanzania. *African Safety Promotion*, 3(1), 21-34.
- Muvuringi, M. P. (2012). *Road traffic accident in Zimbabwe, influencing factors impact and strategies* [Master's thesis]. KIT (Royal Tropical Institute)/Vrije Universiteit Amsterdam Amsterdam, The Netherlands. [https://pdfs.semanticscholar.org/dc66/3ad86d4959f767e1ee2a22c4119f028a4948.pdf?\\_ga=2.88477016.2122072627.1592327953-1532021820.1592327953](https://pdfs.semanticscholar.org/dc66/3ad86d4959f767e1ee2a22c4119f028a4948.pdf?_ga=2.88477016.2122072627.1592327953-1532021820.1592327953)
- Nations, U. (2018). World urbanization prospects. *Demographic Research*, 12(1), 12-25. <https://doi.org/10.4054/demres.2005.12.9>
- Neil, A., Transaid, R., & Transaid, C. B. (2016). Improving road safety through national and regional standards for professional driver training in East Africa. *East African Journal of Public Health*, 3(1), 87–92 .
- Noël C., Barengo, M., Mkamba, S. Mshana, M., & Juhani, M. (2006) Road traffic accidents in Dar-es-Salaam, Tanzania during 1999 and 2001, *International Journal of Injury Control and Safety Promotion*, 13(1), 52-54, DOI: 10.1080/ 15660970500036713
- Ngallaba, S. E., Majinge, C., Gilyoma, J., Makerere, D. J., & Charles, E. (2013). A retrospective study on the unseen epidemic of road traffic injuries and deaths due to accidents in Mwanza City Tanzania. *East African Journal of Public Health*, 10(2), 487–492. <https://doi.org/10.4236/ojpm.2014.44028>
- Odero, W., Garmer, P., & Zwi, A. (1997). Road traffic injuries in developing countries: A comprehensive review of epidemiological studies. *Tropical Medicine and International Health*, 2(5), 445–460.
- Okafor, K. C., Azuike, E. C., & Okojie, P. W. (2014). The causes and prevalence of road traffic accidents amongst commercial long distance drivers in Benin City, Edo State, Nigeria. *Nigerian Journal of Medicine*, 14(5), 3–14.
- Olubomehin, O. (2012). The development and impact of motorcycles as means of commercial transportation in Nigeria. *Research on Humanities and Social Sciences*, 2(6), 231–239.

- Ostendorf, B., & Retallack, A. E. (2019). Current understanding of the effects of congestion on traffic accidents. *Research on Humanities and Social Sciences*, 23(2), 1-15.
- Peden, M. (2004). *World report on road traffic injury prevention*. Geneva, Switzerland: WHO.
- Rustagi, N., Kumar, A., Norbu, L., & Vyas, D. (2017). Applying haddon matrix for evaluation of road crash victims in Delhi, India . *Indian Journal of Surgery*, 32(8), 1–10.
- Salum, J. H., Kitali, A. E., Bwire, H., Sando, T., & Alluri, P. 2019). Severity of motorcycle crashes in Dar es Salaam, Tanzania. *Traffic Injury Prevention*, 20(2), 189–195. <https://doi.org/10.1080/15389588.2018.1544706>
- San, H. P. (2013). Influence of speed and flow rate on road accidents: A case study along federal route. *Traffic Injury Prevention*, 50 (5), 51-70.
- Sanyang, E., Peek, A. C., Bass, P., Young, T. L., Daffeh, B., & Fuortes, L. J. (2017). Risk factors for road traffic injuries among different road users in the Gambia. *Journal of Environmental and Public Health*, 2017(2), 1–10. <https://doi.org/10.1155/2017/8612953>
- Steininger, K. W., & Bachner, G. (2014). Extending car-sharing to serve commuters: an implementation in Austria. *Journal of Ecological Economics*, 101(1), 64–66.
- Surface and Marine Transport Regulatory Authority (2007). *Study on road accidents in mainland Tanzania*. [http://www.tzdpg.or.tz/fileadmin/documents/dpg\\_internal/dpg\\_working\\_groups\\_clusters/cluster\\_1/infrastructure/transport/Transport\\_Sector\\_Investment\\_Programme\\_April\\_2008.pdf](http://www.tzdpg.or.tz/fileadmin/documents/dpg_internal/dpg_working_groups_clusters/cluster_1/infrastructure/transport/Transport_Sector_Investment_Programme_April_2008.pdf)
- Surface and Marine Transport Regulatory Authority (2017). Improvement of Road safety in Tanzania mainland. [https://issuu.com/abubakarcheche/docs/annual\\_report\\_2016\\_2017](https://issuu.com/abubakarcheche/docs/annual_report_2016_2017)
- Toroyan, T., Peden, M., & Laych, K. (2013). World health organisation launches second global status report on road safety. *Journal of the International Society for Child and Adolescent Injury Prevention*, 19(1), 50-61.

- United Nations. (2012). *Placemaking and the Future of Cities. Produced under the auspices of the UN-HABITAT Sustainable Urban Development Network (SUD-Net) with funding from the United Nations Federal Credit Union.* <https://www.pps.org/article/placemaking-and-the-future-of-cities>
- United Nations. (2018). The United Nation revision of world urbanization prospects. *The United Nation, Development of Economi and Social Affairs*, 9(2), 1-17.
- Osoro<sup>1</sup>, Z. & Ng'ang'a, Y. (2015). An analysis of the incidence and causes of road traffic accidents in Kisii, Central district Kenya. *IOSR Journal of Pharmacy*, 5(9), 41-49. [www.iosrphr.org](http://www.iosrphr.org)
- Waldon, M., Ibingira, T. J., Andrade, L., Mmbaga, B. T., Vissoci, J. R. N., Mvungi, M., & Staton, C. A. (2018). Built environment analysis for road traffic hotspot locations in Moshi, Tanzania. *International Journal of Injury Control and Safety Promotion*, 2(1), 1–17. <https://doi.org/10.1080/17457300.2018.1431941>
- World Health Organisation. (2013). *Global status report on road safety 2013.* [https://www.who.int/violence\\_injury\\_prevention/road\\_safety\\_status/2013/en/](https://www.who.int/violence_injury_prevention/road_safety_status/2013/en/)
- World Health Organisation.(2017). *Risk factors for road traffic injuries.* [https://www.who.int/violence\\_injury\\_prevention/publications/road\\_traffic/en/](https://www.who.int/violence_injury_prevention/publications/road_traffic/en/)
- World Health Organisation. (2018). Global status report on road accidents. *World Health Organization Geneva, Swizerland*, 5(1), 12-25.
- World Health Organisation. (2018). *Global status report on road safety 2018.* <https://www.who.int/publications/i/item/global-status-report-on-road-safety-2018>
- Wolfensohn, J. D. (2004). World report on road traffic injury prevention. *World Health Organization*, 7(2), 122-255.
- World Bank. (2018). *Mortality caused by road traffic injury (per 100,000 people).* <https://datacatalog.worldbank.org/mortality-caused-road-traffic-injury-100000-people>
- World Health Organization. (2015). *Global status report on road safety 2015.* [https://www.who.int/violence\\_injury\\_prevention/road\\_safety\\_status/2015/en/](https://www.who.int/violence_injury_prevention/road_safety_status/2015/en/)

## APPENDICES

### Appendix 1: Consent form

Dear Respondent, My name is **Francis Walugembe**, a Masters student in Public Health at the Nelson Mandela Institute of Science and Technology and Ifakara Health Institute. I am currently conducting a research entitled “**The challenge of reducing road traffic accidents in establishing a sustainable healthy urban community in Tanzania.**” I would like you to assist me in answering the questions below. The answers you provide will remain confidential.

#### Consent Form for Study Participants.

**Title of project:** The Challenge of Reducing Road Traffic Accidents in Establishing a Sustainable Healthy Urban Community in Tanzania.

**Name of researcher:** Francis Walugembe NM-AIST/M401/UGA.17 (Nelson Mandela African Institution of Science and Technology)

I ..... agree to participate in this research project. The research has been explained to me and I understand what my participation will involve.

I agree that my participation will remain anonymous YES NO (please circle)

I agree that the researcher may use anonymous quotes  
in his research report YES NO

I agree that the interview may be audio recorded YES NO

I agree that the researcher may take photos of me YES NO

I agree that the information I provide may be used  
anonymously by other researchers following this study YES NO

..... (Signature)

..... (Name of participant)

..... (Date)

..... (Signature)

..... (Name of Research Assistant)

..... (Date)

## Appendix 2: Questionnaire

I am a student at the Nelson Mandela African Institute of Science and Technology/ Ifakara Health Institute (NM-AIST/IHI) pursuing Master's Degree in Public Health Research at the School of Life Sciences and Bioengineering. As part of the requirement for the degree, I am undertaking a research project on Assessing the Challenge of Road Traffic Accidents in Establishing a Sustainable Healthy Urban Community in Tanzania. I would like to request for your participation in this study by answering a few questions. The information obtained is purely for academic purposes and as such will be treated with utmost confidentiality. Do you accept my request? If YES the respondent signs the consent form, questionnaire completion proceeds if NO stop and get another respondent.

### QUESTIONNAIRE

**Region: DAR ES SALAAM**

**District: ILALA**

**Ward: .....**

**Date .....**

#### Section 1: Respondent Demographic Information

1. Gender of the respondent

☐ Male ☐ Female

2. Age group of the respondent

☐ 18 - 20 ☐ 31 - 40 ☐ 51 - 60  
☐ 21 - 30 ☐ 41 - 50 ☐ Above 61

3. Educational Level of the respondent

☐ Certificate ☐ Degree ☐ Other  
☐ Diploma ☐ Post Graduate

4. What is your Position or responsibility at your workplace?.

5. In the following questions, respondent by ticking in the box that corresponds with your level of agreement with each of the following statements regarding *Challenges of Establishing*



*Resilient and Sustainable Healthy Urban Learning Communities in Tanzania.*

**Section B: Strategies for Community engagement**

	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	<b>Strategies of community engagement</b>	1	2	3	4	5
B1	People have the right and opportunity to realize their full potential in health in receiving health services					
B2	The government has structures for building public health policy					
B3	The current city health plan supports community engagement in health urban learning(Dar es salaam has a City Health Plan)					
B4	The current city health plan strengthens community action in health urban learning					
B5	The current city health plan develops personal skills of the community					
B6	The current city health plan reorients health services to the public					
B7	The current city health plan creates supportive physical and social environments					

**Section C: Readiness of Urban Authorities in handling road Traffic Accidents**

	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	<b>Readiness of Urban Authorities in Handling road Traffic Accidents</b>	1	2	3	4	5
C1	The city has adequate policies and rules for managing traffic flow					
C2	The city has enough traffic enforcement officers on major and busy highways					

C3	City authorities conduct routine road worthiness tests on vehicles					
C4	The authorities are aware of the blind spots on major roads in the city					
C5	The road designs reserve space for pedestrian use and crossing					
C6	There is a fully-fledged department for handling traffic accidents					
C7	The urban health centers have the capacity to deal with accident casualties					
C8	The officers occasionally do breathe testing for suspected drunk drivers					
C9	The urban authorities routinely inspect drivers for driving permits					

#### Section D: Effects of road accidents

	Item	Strongly Disagree	Disagree	Neutral	Agree	Strongly Agree
	<b>Section D: Effects of road accidents</b>	1	2	3	4	5
D1	The traffic control department has an updated register of road accidents and casualties					
D2	The Urban authorities spend a lot of money in dealing with road accidents					
D3	Road accidents are the major cause of injuries in the Urban health centers					
D4	The Urban health facilities are outstretched by accident-related cases and incidents					
D5	There has been major changes to road designs in the Urban centers due to road accidents					

## Interview Guide to Road Users

1. Outline the major causes of road traffic accidents in Ilala district

---

---

---

---

2. What are the major types of road Traffic accidents happening in Ilala District?

---

---

---

3. Outline the impacts of road traffic accidents

---

---

---

What should be done to minimize road traffic accidents in Ilala District?

---

---

---

## Focused group discussion Questions

- A. Explain how **Infrastructure** poses a challenge to Resilient and sustainable healthy urban learning communities
- B. How does **Overpopulation** affect the creation of Resilient and sustainable healthy urban learning communities
- C. How does **Pollution** affect the creation of Resilient and sustainable healthy urban learning communities
- D. Explain how **Road Traffic Accidents** poses a challenge to Resilient and sustainable healthy urban learning communities

- E. Explain how *Natural Disasters* poses a challenge to Resilient and sustainable healthy urban learning communities
- F. How does *Governance* affect the creation of Resilient and sustainable health Urban learning communities
- G. Explain the role played by *Community Involvement* in the creation of Resilient and Sustainable health Urban learning communities
- H. How does *Unemployment* affect the creation of Resilient and sustainable healthy urban learning communities
- I. How does *Food safety* affect the creation of Resilient and sustainable healthy urban learning communities
- J. How do *Diseases* affect the creation of Resilient and sustainable healthy urban learning communities

### Appendix 3: Kiswahili version

#### FOMU YA MAKUBALIANO KABLA YA MAHOJIANO

**Title of project:** The challenge of reducing road traffic accidents in establishing a sustainable healthy urban community in Tanzania.

**Name of researcher:** Francis Walugembe NM-AIST/M401/UGA.17

Mimi .....

Nakubalikushirikikatikamahojiano yautafiti. utafiti umenieleze ananimeelewananitashiriki.

Nimekubaliu wepowangu utakuwani wasiri NDIYO HAPANA (zungushia)

Nimekubali mtafiti anaweza situmi majinika tikuandikare potiyake

NDIYO HAPANA

Nakubali mahojiano yetu yanawezakuchukuliwa nakinasasauti

NDIYO HAPANA

Nakubali mtafiti anawezakunipigapicha NDIYO HAPANA

Nakubali taarifa nilizo zito azinawezakutumika nautafiti mwingine

bilayaku tumi majina. NDIYO HAPANA

..... (Saini)

..... (Jina la Mohojiwa)

..... (Tarehe)

..... (Saini)

..... (Jina la Mtafiti)

..... (Tarehe)

..... (IRB Muwakirishi)

Mimi ni mwanafunzi wa chuo cha Sayansi na Teknolojia (Nelson Mandela African Institute of Science and Technology)/ Ifakara Health Institute (NM-AIST/IHI) nafanya Shahada ya udhamivu (Master's Degree) katika Public Health Research at the School of Life Sciences and Bioengineering. Kama sehemu ya mahitajiya degree yangu, Nafanya utafiti wakujua changamoto za ajali na usalama barabarani katika jamii jijini Dar es salaam Tanzania. Naomba uwepo wako katika hii stadi kwa kujibu maswali machache. Taarifa zitakazo chukuliwa ni kwaajili ya masomo, na yatakuwa katika usirisana. Unakubali ombi langu? Kama ndiyo saina fomu ya kukubali, Ujazajiwa questionnaire utaendelea kama hamna kipingamizi na kupata ushirikiano.

#### **KIELEKEZI CHA MAHOJIANO NA WAKUU WA SERIKALI ZA WILAYA**

Taarifa Binafsi

Tarehe----- Miaka----- Jinsia-----

Ngazi (Rank)----- Uzoefu wakazi-----

Q.1.Unadhani ajali za barabarani ni shida kubwa DSM Ilala ?

-----

Q.2. Unalinganisha vipi ajali zinazotokea DSM Ilala?

-----

Q.4. Kuna sheri anakanuni zozote zinazotumika katika usalama barabarani?

-----

Q.5 Kuna changamoto zozote unazipata ya kupata taarifa sahihi za ajali za barabarani?

-----

Q.6. Unapata chanagamoto zozote katika kuhifadhi taarifa za ajali barabarani?

-----

Q.7. Nini kifanyike na maoni katika kupambanana kupunguza ajali DSM Ilala?

-----

Q.8. Serikali ichukue hatua gani katika kupunguza ajali za barabarani Wilaya ya Ilala?

-----

Q.9. Kuna changamoto zozote katika kufuatana kujua sheria za barabaranillala ?

-----

Q.12. Unadha ni nani awe muhusika katika ajali za barabarani?

-----

Q.13. Unadhani sheria na kanuni zilizopo za barabarani zinaweza kupunguza ajali?

**JAMHURI YA MUUNGANO WA TANZANIA  
WIZARA YA MAMBO YA NDANI YA NCHI  
JESHI LA POLISI TANZANIA.**

Anwani ya Simu: "MKUUPOLISI"  
SimuNambari: 21107340

Unapojibu Tafadhali Taja



Ofisi ya  
Inspekta Jenerali wa Polisi,  
Makao Makuu ya Polisi,  
4 barabara ya Ghana  
S.L.P. 9141,  
11483 Dar es Salaam.

PHQ/4/4/7/VOL.VI/41

27/02/2019

Kamanda wa Polisi,  
Kikosi cha Usalama Barabarani,  
**DAR ES SALAAM.**

**YAH: "REQUEST TO OBTAIN PERMISSION TO GET DATA ON ROAD  
TRAFFIC ACCIDENT IN DAR ES SALAAM 2014-2018"**

Husika na somo tajwa hapo juu.

Tumepokea barua isiyokuwa na kumb. Na kutoka kwa WALUGEMBE  
FRANCIS, S.L.P 74 BAGAMOYO mwanafunzi wa Ifakara Health Institute  
ikihusu nada tajwa hapo juu.

Inspekta Jenerali wa Polisi anakuagiza umpatie taarifa hizo ili mradi  
ziwe ni zile zinazo ruhusiwa kutolewa nje ya Jeshi la Polisi.

Pamoja na barua hii nakuletea nakala ya barua husika kwa hatua zako.

Nakuletea kwa utekelezaji.

A.R. MAGAYANE - DCP

Kny: INSPEKTA JENERALI WA POLISI

Nakala:

✓ WALUGEMBE FRANCIS,  
IFAKARA HEALTH INSTITUTE,  
S.L.P 74,  
BAGAMOYO.

Kny: INSPEKTA JENERALI WA POLISI  
TANZANIA



**INSTITUTIONAL REVIEW BOARD**  
**P O BOX 78373 DAR ES SALAAM, TANZANIA**  
Tel +255 (0) 22 2774714, Fax: + 255 (0) 22 2771714 Email: [irb@ihi.or.tz](mailto:irb@ihi.or.tz)

15<sup>th</sup> February, 2019

National Institute for Medical Research  
P O Box 9653  
Dar Es Salaam  
Email: [headquarters@nimr.or.tz](mailto:headquarters@nimr.or.tz)

Francis Walugembe,  
Ifakara Health Institute,  
P O Box 74,  
Bagamoyo.

**IHI/IRB/No: 08 - 2019**

**INSTITUTIONAL CLEARANCE CERTIFICATE FOR CONDUCTING HEALTH RESEARCH**

On 14<sup>th</sup> February 2019, the Ifakara Health Institute Review Board (IHI-IRB) reviewed the study titled: *"Assessing the Challenge of Road Traffic Accidents in Establishing a Sustainable Healthy Urban Community in Tanzania"* Submitted by Principal Investigator: Francis Walugembe.

The study has been approved for implementation after IRB consensus. This certificate thus indicates that; the above-mentioned study has been granted an Institutional Ethics Clearance to be conducted in (Ilala district, Dar es Salaam) Tanzania.


The following documents were reviewed and approved:

1. Study Protocol
2. Informed Consent Forms English and Kiswahili versions
3. Data collection tools in English and Swahili
4. Budget and budget justification
5. Investigators' CVs

The Principal Investigator of the study must ensure that, the following conditions are fulfilled during or after the implementation of the study:

1. PI should submit a six month progress report and the final report at the end of the project
2. Any amendment, which will be done after the approval of the protocol, must be communicated as soon as possible to the IRB for another approval
3. All research must stop after the project expiration date, unless there is prior information and justification to the IRB
4. There should be plans to give feedback to the community on the findings
5. Any publication needs to pass through the IRB
6. The approval is valid until 14<sup>th</sup> February 2020.

*The IRB reserves the right to undertake field inspections to check on the protocol compliance*

  
Deputy IRB Chairperson  
Dr. Ahmed M. Abdallah

  
IRB Secretary  
Dr. Mwifadhi Mrisho



Dar es Salaam  
PO Box 78373  
Tel: 022 2774756  
Fax: 022 2771714

Ifakara  
PO Box 53  
Tel: 0232 625164  
Fax: 0232 625312

Bagamoyo  
PO Box 74  
Tel: 0232 440065  
Fax: 0232 440064

Rufiji  
PO Box 40 Ikwinini  
Tel: 0787 384521  
Fax: 0232 010001

Mtwara  
PO Box 1048  
Tel: 0232 333487

Kigoma  
PO Box 1077  
Tel: 0282 803655

[www.ihi.or.tz](http://www.ihi.or.tz)

---

## NATIONAL INSTITUTE FOR MEDICAL RESEARCH HEADQUARTERS

Telephone: +255-22-2121400  
Telefax: +255-22-2121360  
E-mail: [hq@nimr.or.tz](mailto:hq@nimr.or.tz)  
Website: [www.nimr.or.tz](http://www.nimr.or.tz)



3 Barack Obama Drive  
P.O. Box 9653  
11101 Dar es Salaam  
Tanzania

Your Ref:  
Our Ref: NIMR/HQ/P.12 VOL XXVIII/85

7<sup>th</sup> October 2019

Francis Walugembe,  
Ifakara Health Institute,  
P.O. Box 74  
Bagamoyo

Dear Francis Walugembe,

### RE: PERMISSION TO PUBLISH

Reference is made to your request for permission to publish dated 30<sup>th</sup> September 2019. Permission has been granted to publish a manuscript titled: **“Trends of road traffic accidents, fatalities and injuries in Ilala, Kinondoni and Temeke Municipalities in Dar es Salaam, Tanzania”** by authors: Walugembe, F, Levira, F and D. Lwetoijera.

Please submit an electronic copy of the published manuscript to the National Institute for Medical Research through email [publications@nimr.or.tz](mailto:publications@nimr.or.tz).

Yours Sincerely,

Dr. Ndekya Maria Oriyo  
Director of Research Information, Technology and Communication

---

*All correspondences should be addressed to the Director General*

Amami Research Centre  
P.O. BOX 81, Muhesi  
Tel: +255-27-2641445  
Fax: +255-27-2641320  
Email: [amami@nimr.or.tz](mailto:amami@nimr.or.tz)

Mbeya Research Centre  
P.O. BOX 2410, Mbeya  
Tel: +255-25-2503364  
Fax: +255-25-2503134  
Email: [nimr-mbeya.org](mailto:nimr-mbeya.org)

Muhimbili Research Centre  
P.O. BOX 3436, Dar es Salaam  
Tel: +255-22-2132232  
Fax: +255-22-2150458  
Email: [muhimbili@nimr.or.tz](mailto:muhimbili@nimr.or.tz)

Mwanza Research Centre  
P.O. BOX 1462, Mwanza  
Tel: +255-28-2500399  
Fax: +255-28-2500654  
Email: [mwanza@nimr.or.tz](mailto:mwanza@nimr.or.tz)

Ngongongare Research Centre  
P.O. BOX 514, Arusha  
Tel: +255-732-979610  
Fax: +255-22-2121400  
Email: [ngongongare@nimr.or.tz](mailto:ngongongare@nimr.or.tz)

Tabora Research Centre  
P.O. BOX 482, Tabora  
Tel: +255-26-2604219  
Fax: +255-26-2604943  
Email: [tabora@nimr.or.tz](mailto:tabora@nimr.or.tz)

Tanga Research Centre  
P.O. BOX 5096, Tanga  
Tel: +255-27-2646044  
Fax: +255-27-2645869  
Email: [tanga@nimr.or.tz](mailto:tanga@nimr.or.tz)

Tukuyu Research Centre  
P.O. BOX 538, Tukuyu  
Tel: +255-25-2552214  
Fax: +255-25-2552016  
Email: [mwanza@nimr.or.tz](mailto:mwanza@nimr.or.tz)

UNITED REPUBLIC OF TANZANIA  
MINISTRY OF HEALTH, COMMUNITY DEVELOPMENT, GENDER,  
ELDER AND CHILDREN

DAR ES SALAAM REGION  
ADDRESS: "HEALTH"  
PHONE: 022 - 2861903



AMANA REGIONAL REFERRAL  
HOSPITAL  
P.O. BOX. 25411  
DAR ES SALAAM.

IN REPLY PLEASE QUOTE

REF. NO. MOHCDGEC/ARRH/R.I/X.22

02/04/2019

Walugembe Francis,  
C/O Ifaraka Health Institute,  
P.O. Box 74  
**BAGAMOYO**

**RE: PERMISSION FOR STUDENTS ATTACHMENT**

Refer to your letter dated 26<sup>th</sup> March, 2019 which requested us to allow Francis Walugembe to conduct and collect data in our institution.

We are here to acknowledge your request with the following conditions, that Francis Walugembe must submit the results of his research after completion of analysis in order the hospital to make use of the data's to solve hospital problems.

Regards.

Dr. Pili Kimanga (Research Coordinator)  
**FOR: ASSISTANT DIRECTOR**  
**AMANA REGIONAL REFERRAL HOSPITAL**

*To  
Include Minor theatre  
Please kindly assist him  
Dr. Kimanga*